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Contents:

	PAGE
The Electrical Research Association	1
Registration and Regulations	2
Radio Apparatus fed from the Mains	2
Foreign Capital in the German Electricity Industry	2
Institution of Electrical Engineers (*illus.*)	3
Successful Partnerships	7
Electrical Contractors' Conference.—II (*illus.*)	8
Presidential Address, by W. A. Shaw	9
The Annual Report	10
Electricity Supply at Maidstone (*illus.*)	10
The Joint use of Poles for Power and Communication Lines	12
Business and Industrial Notes	14
Lighting and Power Notes	18
Tramway and Railway Notes	20
Telegraph and Telephone Notes	20
Radio Notes	21
Contract Information	21
Forthcoming Events	22
Notes	23
Our Personal Column	25
Financial Section—	
New Companies Registered	26
Official Returns of Electrical Companies	26
City Notes	27
Stocks and Shares	29
Scottish Electrical Contractors (*illus.*)	31
The National Physical Laboratory	31
The I.M.E.A. in the West Country.—V (*illus.*)	32
Selling More Electricity for Domestic Purposes, by W. A. Vignoles	32
Domestic Electrification: Development and Selling	33
The I.M.E.A. Exhibition	33
The Institution of Civil Engineers.—V	35
Tidal Power and Turbines Suitable for its Utilisation, by Arnold Hartley Gibson	35
The General Trend of Modern Development in Steam-turbine Practice, by Henry Lewis Guy	36
Heavy Internal-combustion Engines, by Geoffrey Porter	37
The Electrical Research Association	38
New Electrical Devices, Fittings, and Plant (*illus.*)	40
N.W. England Electricity Scheme (*illus.*)	41
Legal	41
Parliamentary News	42
Correspondence—	
Alternating Current in Three-core Mains	42
Super-pressure Cables	42
A Small Circuit-breaker	42
Directional Wireless and Marine Navigation	43
Published Specifications	43
Trade Mark Applications	43
New Work for Contractors	44

The Electrical Research Association.

THE Conference with regard to the future of the Electrical Research Association, of which a report appears elsewhere in this issue, put forward an extraordinarily strong case on behalf of the "B.E.A.I.R.A." The success attained in the past, under the admirable guidance of the director, Mr. E. B. Wedmore, by his thoroughly competent staff has had far-reaching results, of the greatest value to the electrical industries; as Mr. C. P. Sparks remarked, the results were out of all proportion to the funds at the disposal of the Association. The enthusiasm of Mr. Ll. B. Atkinson was reflected in the eloquence with which he marshalled facts and figures in support of the cause for which he spoke. We need not labour the point—every electrical engineer who has taken the trouble to ascertain the nature and quality of the output of the E.R.A., and to compare it with the scanty input, must long ago have come to the conclusion that the staff had an efficiency far above 100 per cent.; for it has produced a great deal out of very little. So far as our readers are concerned, we feel sure there is no need to add to what we have said on previous occasions in support of the claims of the Association to be placed on a sound financial basis.

But unfortunately, that is not sufficient; we must go further, and convince those who control the purse that it is desirable to support research, that research delivers the goods, and that a pound spent on research will come back with others to keep it company. How can that object be attained? Even the board of directors of a company does not always appreciate the importance—nay, the necessity—of research; how, then, can we hope to bring home the truth to the non-technical and often non-commercial men who are elected to local government and who form the committees in charge of the bulk of our electricity supply? We do not mention women, feeling confident that these at least, when appointed to committees, will recognise the

merits of research, they being inherently of an inquiring disposition. It is a problem which each engineer and manager must face—knowing that of all the branches of electrical industry, the supply branch has benefited most abundantly in the past from the work of the Association, and in common fairness and common sense ought to bear its full share of the cost. A contribution to the funds of the Association is not a tax, or a levy on the ratepayers' property—it is a just and lawful repayment of a fraction of the debt they owe to the Association, estimated at £4,000,000 in the case of existing cable networks alone, plus £250,000 a year to boot. How well equipped the E.R.A. would be if it could but lay hands on one-tenth of the sum it has already enabled the industry to save!

No doubt the steps that should be taken to put the matter in the right light before those whose opinions count will be very carefully considered. Public opinion must be educated—and we believe that this will be found easier than might be supposed; the man in the street is no fool. Councillors should be fully informed, through their daily papers or by other means, with regard to the facts, before any suggestion is made that they will be invited to vote on the subject—in other words, the proper atmosphere should be created; and evidence should be prepared showing the benefits already derived by their undertakings from the work of the Association. We need not further elaborate the matter —no doubt the engineer is better equipped than we are to devise a plan of campaign. We pass, therefore, to the question what is to happen if his efforts fail? It was suggested at the Conference by Mr. F. W. Purse that the only way to get all the local authorities to contribute was by compulsion; but that would be a drastic course.

The Electricity Commissioners, as Mr. T. P. Wilmshurst stated, have no power to contribute annually to the funds of the E.R.A., but we may point out that they are authorised by the Act of 1919 to "conduct experiments or trials for the improvement of the methods of electric supply or of the utilisation of fuel or water-power" through any competent body, and to "incur such expenditure as may be necessary for the purpose," subject to the approval of the Ministry of Transport. They have already, in fact, commissioned the Association to carry out experiments on switchgear, and the cost of such investigations is spread over the whole of the authorised undertakings of the country, which, of course, stand to profit by the results. Hence the Commissioners are in a position to relieve the Association of at least a portion of the cost of conducting researches for specified purposes, under their existing statutory powers.

Registration and Regulations.

WHEREVER electrical contractors are gathered together, as they are at Cheltenham this week, discussion turns to that evil genius of the trade, the "shoddy" contractor (or "kerbstoner") and his elimination.

Short of actual violence upon the part of the legitimate or worthy contractors, there are three methods of combating the evil; they are compulsory registration, the enforcement of wiring regulations, and the education of the public. The first two are very drastic and repugnant to a good many genuine contractors; the last is preferable but extremely difficult to carry out.

Dealing with the three methods in order: it would appear that compulsory registration or the licensing of contractors, while it would meet with the approval of a large body of the supply and contracting industries, would still have formidable opposition strong enough to make any Government hesitate to legislate on the subject. On the other hand, insistence upon work conforming to a code of regulations is more or less the affair of the supply authorities, and the precedent of West Ham may be followed by other municipal undertakings. The adoption of wiring rules has been proved practicable, but, so far, only local in its effect. Any spread of the principle on the same lines may lead to widely varying conditions in different localities. We can almost imagine the descent of hordes of "kerbstoners" upon "unregulated" districts. In his remarks at Cheltenham, Mr. W. A. Shaw put the greatest emphasis on the education of the public and the advocation of a *national* code of compulsory wiring regulations. He considered that practical progress would be made by devoting special attention to advertising the National Register of Electrical Installation Contractors to the public. At present the public, being ignorant of the existence or the nature of the Register, is unmoved if a contractor is struck off. It is the electrical contractors' duty to instil into the public mind the difference between good and bad work; to back the Register; and to consider whether a definite guarantee can be associated with membership of the E.C.A.

Radio Apparatus fed from the Mains.

As long ago as September, 1924, we drew attention to the danger attending the use of radio apparatus and domestic electrical appliances, in the event of faults occurring simultaneously on both circuits; on June 3rd and September 9th, 1927, we regretfully recorded fatalities which had taken place under the conditions which we had outlined, pointing out in the latter case (as we had indicated on August 26th) that the risk was aggravated when battery eliminators were used, and we urged that transformers or condensers should be interposed, to isolate the radio circuit from earth.

We are pleased, therefore, to announce that additional regulations in respect of radio apparatus connected to electric supply mains have been issued by the Institution of Electrical Engineers, as a supplement to the Ninth Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings. An abstract of the new rules appears elsewhere in this issue. They have been prepared by a Sub-Committee on which the Radio Manufacturers' Association and other interested bodies were represented, and that Association has approved them and will endeavour to secure compliance with them.

This risk is a very real one, and we hope that users of radio apparatus, in their own interests, will take pains to guard against it. As we have previously suggested, the B.B.C. ought to broadcast a warning on the subject from time to time.

Foreign Capital in the German Electricity Industry.

As our readers are aware, the development of the German electricity industry since the stabilisation of the currency has been financed to a considerable extent by foreign capital. Information just to hand shows that during the first half of the present year for electricity supply works, eight loans have been raised abroad to the amount of 244 million marks, thus making a total of 764 million marks placed in foreign loans since the beginning of 1925. Allowing, however, for loans issued for conversion purposes and for the re-purchases and redemption already carried out, it is calculated that the foreign indebtedness of the electricity works is reduced to about 650 million marks. In addition to the above obvious foreign issues, however, considerable capital from other countries has accrued to the electricity works through the loans raised by German towns and States; the amount thus available for electricity works is estimated at a further 550 million marks. Taken altogether it is computed that an aggregate of 1,200,000,000 marks (say £60,000,000) of foreign capital in long-term loans is invested in German electricity supply works at the present time. This sum is quite apart from the large short-term credits which exist. The lenders have been chiefly the United States and Switzerland.

Institution of Electrical Engineers.

An account of the Summer Meeting at Glasgow and Edinburgh, and in the West Highlands.

(*Continued from page* 1127.)

Edinburgh Visits and Excursions.

On the second day of the meeting (Wednesday, June 27th) members left Glasgow by special train, travelling through the Scottish coal and shale areas to Edinburgh, the beautiful capital City which gained very early scientific prominence, and is famous the world over hardly less for its splendid educational facilities than for its historical associations of time immemorial, where the following forenoon visits had been arranged:—

(i) One party drove in motor coaches *via* Princes Street, the National Gallery and Royal Academy, crossing the High Street near St. Giles' Cathedral, Heriot's School, Lauriston, The Meadows, Arthur's Seat, Samson's Ribs and Duddingston Loch to the Edinburgh Corporation's electricity generation station at Portobello (which is referred to below), where refreshments were served and the plant inspected.

(ii) The other party enjoyed an alternative excursion by motor coach to Holyrood Royal Palace and the Castle on its massive rock, through which the visitors were conducted by guides, Earl Haig's statue, the wonderful Scottish national war memorial and other places of historic interest.

Both parties returned to the City for luncheon at the North British Station Hotel, and in the afternoon the visitors again divided themselves as follows:—

(iii) One section drove out to the works of Bruce Peebles & Co., Ltd., which were inspected, and are referred to below, tea being provided by the Company.

(iv) The other contingent took part in an excursion to Queensferry, where tea was served at the Hawes Inn, the Forth Bridge and the Deer Park of Hopetoun House, the conveyances returning to the City *via* Turnhouse aerodrome and the Scottish Zoological Park.

The Corporation of Edinburgh provided the motor coaches, and a special train conveyed the party back to Glasgow in the evening.

The Portobello Power Plant.

It will be recalled that the Edinburgh Corporation's Portobello power station was officially opened by King George V in July, 1923. The first portion, which has already been described[4], of this seaside plant consisted of three three-phase, 6,600-volt, 12,500-kW (m.c.r.) Brown, Boveri turbo-alternators, with W. H. Allen condensing plant. In 1925 a fourth 12,500-kW set, of Metropolitan-Vickers manufacture, was installed, followed shortly afterwards by the transference of a 5,000-kW set (fitted with a new Parsons turbine) from one of the Corporation's older stations; this brought the station's capacity up to the present figure of 55,000 kW (m.c.r.). To the six boilers originally installed, of the Stirling tri-drum type, two more were added in 1925; the capacity of each is 65,000 lb. per hour, and the working pressure 300 lb. per sq. in. superheated to 700 deg. F.

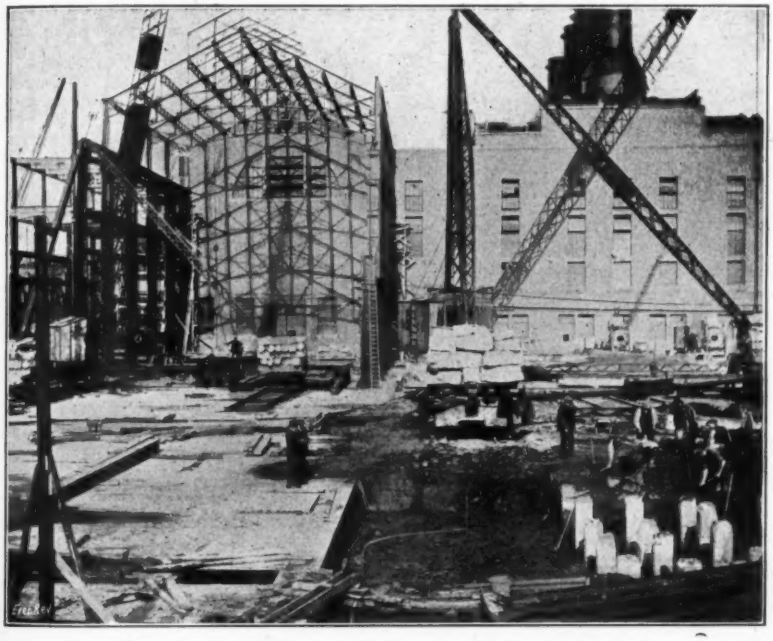


Fig. 7.—Portobello Power House Extension, 1927.

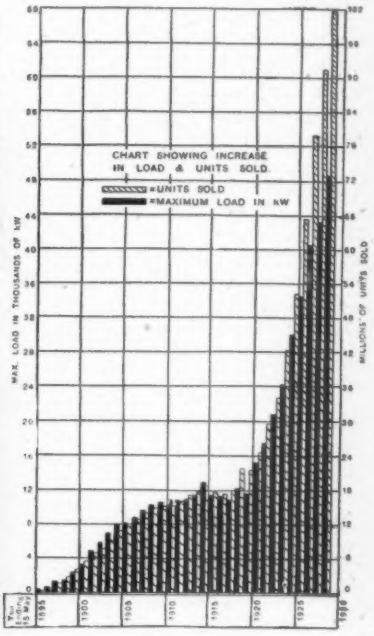


Fig. 8.—Chart of Energy Sold and Load Increase, Edinburgh Corporation.

The coal used is principally washed "Pearls," having a calorific value of 10,500 B.th.u., from the Lothian coalfield, most of which is within a radius of about six miles.

The condenser-cooling water is drawn from the estuary of the River Forth through three tunnels of 57 in. inside diameter and 500 yards long, terminating in shafts 9 ft. in diameter. Suction and discharge bus-pipes are connected between the land shafts in such a manner that each may be used for discharging the water in turn, thus reversing the flow, which method of circulation has proved effective in preventing the growth of mussels in the culverts. The existing main switchgear is of the concrete-cell type of the British Thomson-Houston Co., Ltd.

The extensions now in hand (the commencement of which is indicated in fig. 7) include two turbo-alter-

[4] ELEC. REV., September 23rd, 1921, and July 13th and 20th, 1923.

nators, each of a maximum continuous rating of 31,250 kW at 6,600 volts and 1,500 r.p.m., supplied by the British Brown, Boveri Co., Ltd. Each set will be fitted with twin condensers and duplicate extraction pumps by

Fig. 9.—Laying 72-in. Condenser Pipes at Edinburgh.

W. H. Allen, Sons & Co., Ltd. Four additional Stirling boilers of the same rating as the existing ones, but fitted with air heaters and grit arrestors, are under construction. In addition, another four boilers will shortly be ordered, which will bring the total number to 16, with a maximum evaporative capacity of 1.32 million lb. per hour.

Extensions to coal sidings and conveying plant in hand have been designed to unload up to 120 railway wagons per day, representing approximately 1,000 tons of coal. The pump-house is being extended to accommodate three new pumps, two of which have been ordered from W. H. Allen, Sons & Co., Ltd. Each pump will be capable of delivering 30,000 gallons of water per minute against a total head of 50 ft., and will be coupled to two 625-b.h.p., 6,600-volt Bruce Peebles induction motors. Fig. 9 shows two 72-in. circulating-water culverts being buried beneath the raft of the pipe annexe between the boiler house and turbine room. The extension switchgear is being manufactured by the Metropolitan-Vickers Electrical Co., Ltd., and is of the compound-filled type. Each switch will have a breaking capacity of 1,500,000 kVA, and the weight of each, complete with oil, is 31 tons. In this design of gear the busbar selector switches, as well as the isolating switches, are oil-immersed and operated electrically from the control board. Duplicate sets of busbars are provided, and they will be normally coupled together through reactances. It is believed that this is the largest metal-clad unit so far manufactured (fig. 10). The circuit breakers for the alternators are designed to carry 3,500 amperes at 6,600 volts.

The curve (fig. 8) reproduced on page 3 shows the rate of growth of the Edinburgh Corporation electricity undertaking, of which Mr. Edwin Seddon is engineer and manager. The energy sold for the year ending May 15th, 1928, totalled 101,714,000 kWh, and the maximum load amounted to 48,400 kW. In accordance with the supplementary particulars of the Central Scotland national scheme prepared by the Electricity Commissioners, the Portobello station will be required to produce 337,500,000 kWh in 1930-31, with a maximum demand of 100,750 kW, which figures will increase to 378,600,000 kWh and 112,500 kW maximum demand by the following year. The present extension at Portobello will bring the total maximum rating of the station up to 117,500 kW, with provision made during the exten-

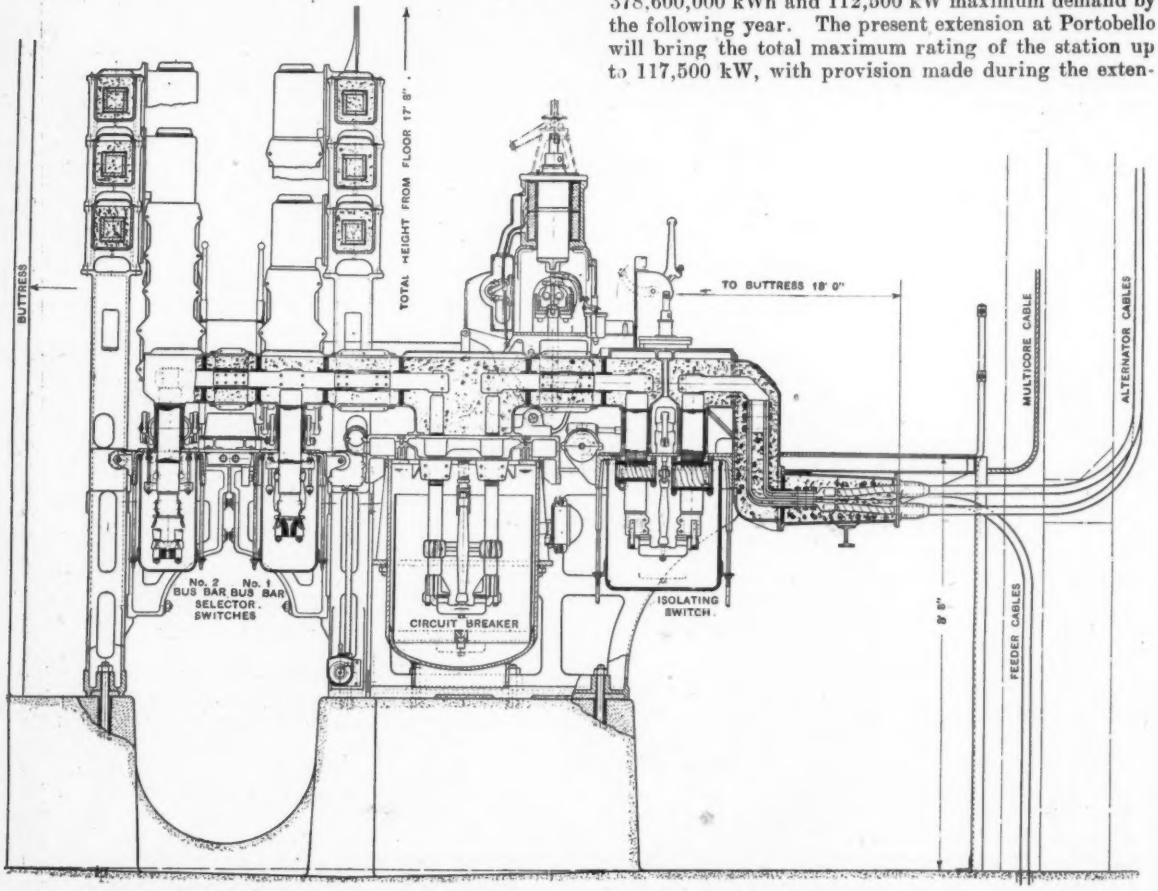


Fig. 10.—Cross-sectional View through Main Oil Switch, Isolating Switch, Selector Switches and Bus-bars, Portobello.

sion of the raft, seawork, &c., for a further set which will bring the final station capacity to 150,000 kW.

Messrs. Bruce Peebles' Works.

Situated on the north side of Edinburgh, overlooking the Firth of Forth, the site is readily accessible by sea *via* the docks at Granton and Leith and by land *via* the

L.M. & S. Railway, to which the works are connected by private sidings. The firm has been connected with the manufacture of electrical machinery for more than 30 years, and in order to keep in step with development a large new shop has been built and specially equipped for the manufacture of transformers of all types and sizes. Incidentally, this departure from the particular line of manufacture in which the firm has specialised for so long has introduced a new and important industry to Scotland.

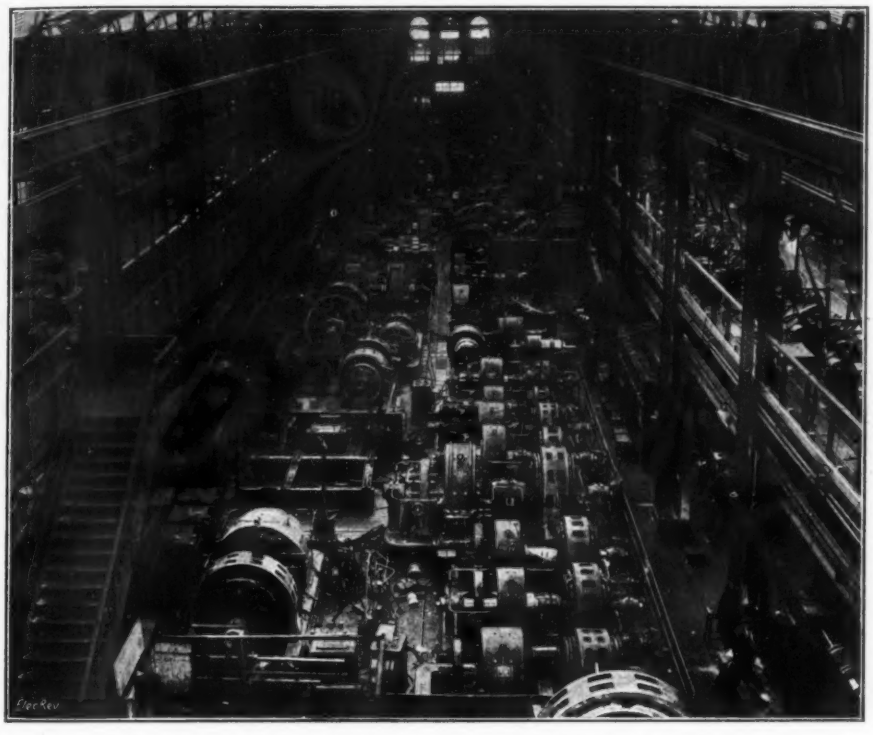


Fig. 11.—Peebles Main Electrical Shop; Plant on Test in Foreground.

The electrical machinery shop main building is 600 ft. long and 150 ft. wide, divided into five bays (fig. 11). The picture is of particular interest in that it shows no less than 11 motor convertors and two motor-generators, varying in size from 300 to 1,500 kW, on test at the same time, this plant having an aggregate capacity of 8,500 kW. The centre bay is devoted to heavy machine-tools, winding, erection and the testing of the larger types of machinery, whilst almost all the lighter work is dealt with in the side bays and galleries. The railway enters both ends of the shop, the raw materials and castings being brought in at the south end, whilst the finished machinery is dispatched on the line leaving at the north end; there is thus a constant forward movement of all parts towards the packing department.

The machine-tools are of modern design, and are electrically driven on the sub-divided group system, except in the case of the very heavy tools, which are individually driven. One of the noteworthy features is the number of automatic tools located in different parts of the works for the accurate and rapid production of standard parts. Suitable electrically-driven overhead cranes and hydraulic hoists are installed in all parts of the factory to enable work to be readily handled during the various stages of manufacture. The Testing Departments are fully equipped, and situated near by is the power plant, consisting of a boiler house, pump houses, steam-generating and converting plant, and a storage battery room.

Large plant, with individual parts weighing up to 30 tons, is dealt with in the heavy engineering shop, which is a separate building.

The transformer shop (fig. 12) consists of one main bay 325 ft. long by 60 ft. wide, spanned by a 20-ton overhead electric travelling crane, and the lay-out is such that handling is reduced to a minimum. Special coil-winding machines are in use, by means of which the coils are wound and insulated in an accurate and neat manner. The vacuum-drying (fig. 13) and varnish-impregnating plant is designed to give a high degree of vacuum and pressure, thereby ensuring thorough drying and varnish treatment of all windings.

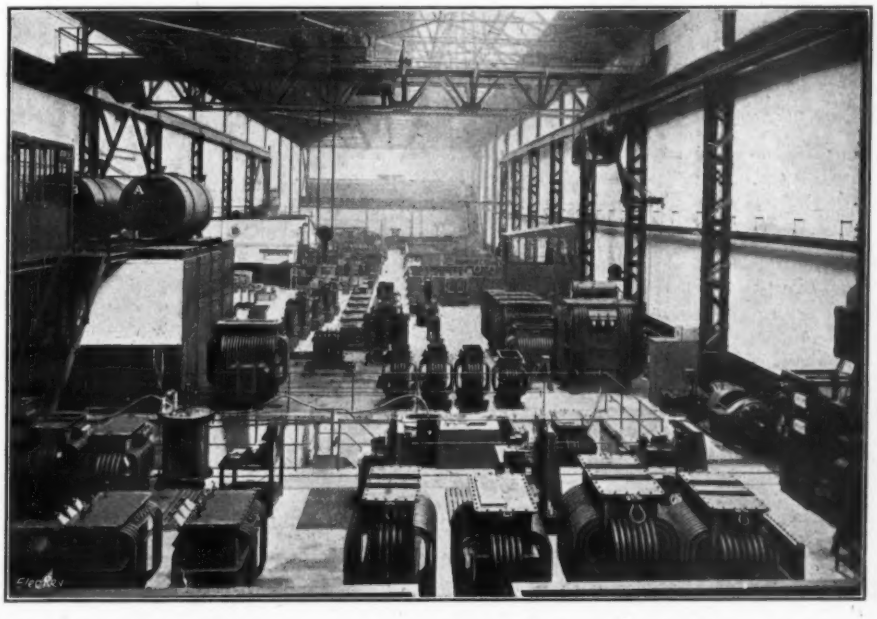


Fig. 12.—Peebles Transformer Shop; Testing Pit in Foreground, Drying Ovens on Left.

Centrifugal purifiers are installed for the treatment of transformer oil, and large storage tanks are provided. No oil is used in, or dispatched with, transformers without first having been passed through the purifying

plant. The testing department is very fully equipped with motor-generator sets, e.h.p. testing transformers and measuring instruments, and a dock has been provided at the despatch end of the shop, so that the complete units can be loaded direct on to railway trucks and covered up before leaving the shop.

In concluding this brief sketch of one of the largest electrical works in Scotland, it should be stated that the firm manufactures all sizes and types of electrical machinery, including alternators, dynamos, a.c. and d.c. motors, synchronous motors, synchronous induction motors, balancers, boosters, motor-generators, frequency changers, rotary convertors and motor convertors, and also all sizes and types of transformers. Fig. 14 illustrates a 10,000-kVA, three-phase, 50-cycle, 10,500/6,300-volt outdoor sub-station.

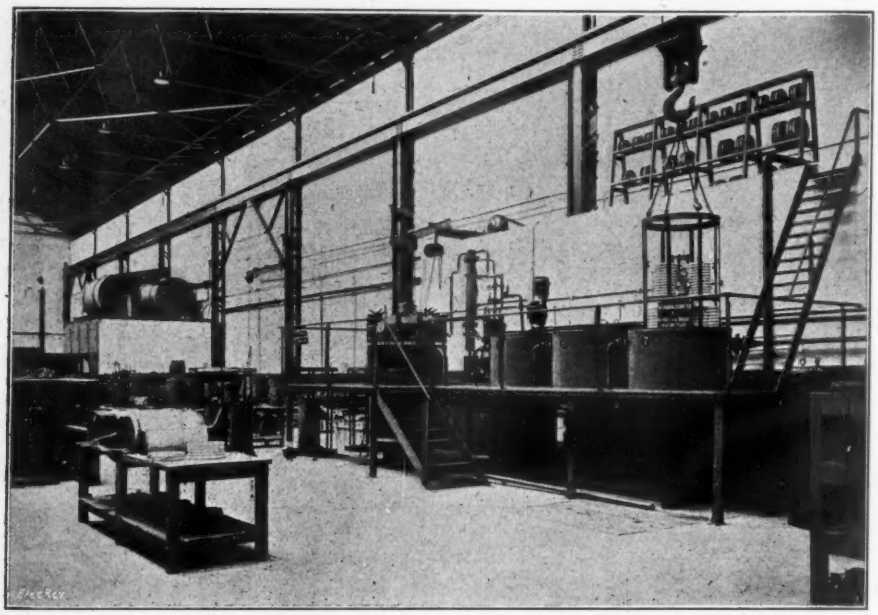


Fig. 13.—Vacuum Drying and Impregnating Plant, Peebles Works.

Originally founded in 1897 as the Electrical Department of the business established in 1866 at the Tay Works, Leith, by Mr. David Bruce Peebles, few engineering establishments occupy so healthful a site: on the north a view of the Firth of Forth is obtainable and to the west the Highlands, Ben Ledi, Ben Lomond, and other mountains are plainly visible in the distance on a clear day; to the south are the Pentland Hills, Arthur's Seat, the Castle Rock and the spires of Edinburgh City. The first part of the present factory was completed in 1903 and important additions were made in 1918 and 1925, La Cour motor-convertors, with which the Company's name has so long been associated, being still one of its specialities. The works are divided into bays in the usual manner, with galleries for light work as some of the accompanying illustrations indicate. The main offices are in a separate building which accommodates most of the technical and commercial staff as well as the administrative offices, staff dining rooms, and other departments; the drawing office is also housed in a separate building, and an extensive technical and general library is available for the use of the staff and work people. The works also contains a large kitchen and canteen which provide meals for the employés, and fully-equipped ambulance and fire brigades are maintained in constant readiness to deal with emergencies.

Other Activities.

During the drive round the outskirts of the City some evidence of the work of the Lothians Power Co. was noticed.[5] This active concessionaire of the Edinburgh Corporation is rapidly extending the availability of electricity over a wide area, which includes many towns of considerable size, collieries and factories.

By arrangement with Prof. F. G. Baily, of the Heriot-Watt College, the Radiological Department[6] of the Edinburgh Royal Infirmary was open to inspection by such of the visitors as desired to seize the opportunity.

Messrs. Adam Hamilton & Sons, Ltd., of Paisley, a branch of the Bradford Dyers' Association, Ltd., extended an invitation to members who could find time to do so to visit their Ruths steam accumulator installation, which method of steam storage was described in our May 28th, 1926, issue, p. 807. Cordial invitations to visit their works were also extended to members by: Mavor & Coulson, Ltd. (new works at East Kilbride); Drysdale & Co., Ltd., Yoker, Glasgow; Glasgow Corporation's new Govan refuse power works (Mr. C. H. Macfarlane, superintendent, Cleansing Department); and Harland Engineering Co., Ltd. (in association with the British Electrical Plant Co.'s works at Alloa) which manufactures all type of generators, motors, and rotary convertors up to about 1,500 kW capacity, and all kinds of centrifugal pumps. *(To be continued.)*

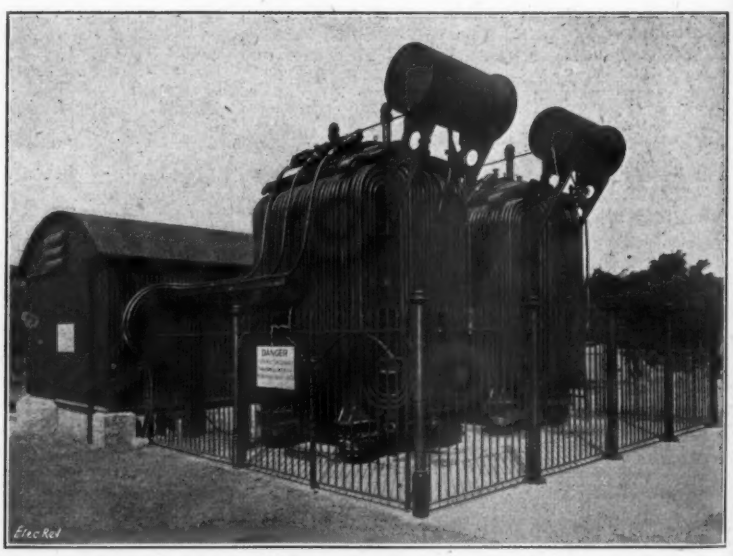


Fig. 14.—Bruce Peebles 10,000-kVA Sub-station.

[5] See ELEC. REV., February 29th, 1924, p. 356, October 24th, 1924, page 640.

[6] ELEC. REV., October 15th and 29th, 1926.

Successful Partnerships.

The Personal Element.

(COMMUNICATED.)

MANY who are desirous of taking a partner into their business are faced with the problem: "Shall I be able to get on with him?" It must be admitted that there is always an element of risk when personal qualities are concerned, and it is this aspect which deters many from taking in additional capital which would otherwise be very acceptable in extending a profitable concern.

It will be seen from this that there are many matters, in addition to the question of capital, which require careful consideration before definitely agreeing to take a partner. One or two general hints may be put forward. Most successful partnerships have been brought into existence by the co-operation of parties who, although their object may be the same, bring different qualities to bear in the conduct of the business.

Thus one may have a complete practical and technical inside knowledge of the business or profession, but lacks the necessary qualifications for looking after the financial side of the enterprise. In this case, it will generally be found that the other partner completes the management of the business by taking charge of the "outside" interests, sees that, whilst the technical services of the firm give satisfaction to clients, no opportunity is lost in making profit by equitable charges and judicious economy. It is rare that the really practical partner—thoroughly conversant with the particular trade—is also the man to make the best contract with customers.

The necessity of two temperaments which will work together without clashing is, of course, most important of all. For this reason, it is preferable in coming to terms with a prospective partner, to make quite sure that one can "get on" with him or her. Partnerships, after all, are a type of business marriage, and the ups and downs of the business are no less fraught with possible internal disputes than the domestic side of life.

Mutual Confidence Necessary.

Personal references, therefore, play a large part in one's final selection of a business partner. There is an old cynical adage about one partner having the experience and another the capital, whilst later on the positions are reversed. But in practice, the first part of the arrangement, providing there is mutual confidence and co-operation, often leads to the establishment of a successful partnership.

Many of the skilled craftsmen and professional men and women to-day, whilst being masters of their trades, lack the necessary capital to set up for themselves. There are equally men and women, through various circumstances, who possess funds, but lack the technical knowledge which would enable them to employ their capital in a business to the best advantage. These are the types of individuals which, in combination, often bring about the best results in partnership.

So long as there is a common determination to succeed, many of the minor questions which often lead to trouble should be ignored. There is the case, for example, where one partner may devote too much time, in his colleague's opinion, to the social side of life, which is a fruitful source of argument about "neglecting the business." In point of fact, in some businesses and professions, the social side is a very definite source of profit by introductions.

The Value of Personality.

There is another aspect which sometimes takes time to understand, which may be briefly classified as the partner with a "temper." This is the type of individual which often makes his associate nervous and uneasy by his dealings with the clientele; but, so long as the main business qualities are possessed by him, too much importance need not be attached to any occasional signs of a strong personality. It must be remembered that personality counts a great deal in the successful control of business, and that some clients "take" to a personality—because, perhaps, of his straightforward, matter-of-fact attitude—notwithstanding his personal characteristics which may not appeal to all.

It is because of these various personal questions that the matter of partnership requires a great deal of give-and-take in the successful management of the business. But that "two heads are better than one" has often been proved a most valuable asset in policy, organisation and management, and, for this reason those who seek to extend their business by taking a partner with them should not be put off because of the "ifs" and "perhaps," which occur to the mind. There is an element of risk in all ventures requiring outside co-operation, and the personal element of a prospective partner, whilst it should not be disregarded, need not be exaggerated.

Partnership Taking Over an Existing Business.

Let us suppose that a partnership is being formed to take over an existing business. To-day there are large numbers of people with varying amounts of capital who are seeking an opening for which they have no decided preference, so long as it offers a good prospect of financial success.

In the first place, a necessary safeguard is to deal through an agent whose integrity can be relied upon. Recommendations of businesses need expert scrutiny and investigation whether they are put forward from private sources or through an advertisement. Next, if capital has to be raised, avoid moneylenders or their agents. A partnership arrangement has much to commend it, provided a partner with whom one can work and who is well recommended can be found.

Then comes the question of selection. Much depends, of course, on the amount of capital available. But, in general, it is far safer to start in a comparatively small way—leaving a good margin for emergencies—than to select a bigger proposition than one can comfortably handle. It is policy, however, to pay a good price, even a high figure, for a thoroughly sound concern, than a low one for a business which has seen its best days.

An important point for buyers to remember is that there are fashions in business as in every other line. To-day the progressive type is the business which gives an impression of new methods. If it is a manufacturing plant it must be up-to-date with time and labour-saving appliances. If it is an office, it must be well fitted and equipped, very different from the air of antiquity which appeared to be the pride of Victorian days.

There is one aspect which may be mentioned which, whilst it may still be considered a draw-back, is gradually losing its bad effect. The fact that an establishment was in a back street was usually regarded as an unfavourable point. The telephone has removed some of these disadvantages. Many orders, particularly for household requisites, are now placed regularly by telephone.

These are the general points which may be of special interest to those who are weighing up the pros and cons of several businesses which are being offered, and from which it may be difficult to make the final selection.

Electrical Contractors' Conference.-II.

Proceedings at Cheltenham.

THE third annual conference of the E.C.A. Allied Associations, at Cheltenham, is now in progress. The arrangements were fully dealt with in our last issue, and it is merely necessary to say that the President's reception on Wednesday evening was very successful and attended by a very large throng of members and their friends.

Yesterday (Thursday) morning saw the commencement of business, which included the presentation of the annual report and the reading of his presidential address by Mr. W. A. Shaw, both of which appear in abstract form on succeeding pages. Mr. Shaw's portrait accompanies his address; that of Mr. W. H. Walton, who is to be installed as President to-day (Friday), appears on this page. We also reproduce photographs of the authors of the three papers, which provide food for thought and subjects for discussion for the delegates.

Mr. Shaw's report exhibits the E.C.A. Group as one of the most active and most successful organisation in the industry. It also showed, however, the urgent need for more publicity—"public" publicity—if the sound contractor is to put an end to the shoddy parasites which bring the industry and electricity generally into disrepute. It is true, as Mr. Shaw said, that the public is not greatly concerned if a contractor is struck off the register—merely because it does not know what the Register is. It is pleasing to hear that the Associations are financially sound, and to know that harmonious relations are being preserved between the members and their employés.

Elliott & Fry] *[London.*

Mr. W. H. Walton,
The new President of the E.C.A.

A great part of the presidential address was an appeal for closer co-operation between the various sections of the industry. Mr. Shaw was able to report increasing unity of purpose among the members, and improving relationships between members and their local electricity supply authorities. He advocated the adoption of a compulsory code of wiring rules, power of inspection and approval being given to electricity supply departments. One method of minimising shoddy work is by members supporting the principle of indentured apprenticeship in which direction the Association has done a great deal of work.

We intend to deal with the papers and discussions in our next issue.

This afternoon the delegates are attending a garden party at Pittville Park, and the Conference concludes this evening with a ball and supper at the Town Hall upon the invitation of His Worship the Mayor of Cheltenham (Ald. C. H. Margrett, C.B.E., J.P.). Arrangements have been made for the convenience of those who are staying in Cheltenham over the week-end.

Elliott & Fry, London.

Left: Mr. W. R. Rawlings, A.M.I.E.E. ("Earthing as a Safeguard to the Public"); centre: Mr. J. Orringe, A.M.I.E.E. ("Electrical Development, with Special Reference to Retail Sales"); right: Mr. H. Marryat, M.I.E.E. ("Trading Without Tears: The E.C.A. Policy").

The Authors of the Papers read at Cheltenham.

Presidential Address.

(Abstract).

In the course of his address, delivered after the annual meeting on Thursday, Mr. SHAW said that the Association's first conference, at Brighton, was entered upon, perhaps, with some feelings of hesitation, but it proved an immediate and huge success. The proceedings at Scarborough demonstrated that the success of the first conference was by no means due to its novelty. Scarborough proved that an annual conference filled a definite place, and supplied a human need, in such a scattered organisation as theirs; and that splendid gathering at Cheltenham had set a seal of final approval upon the whole idea of those re-unions of their national membership.

They were not alone in the world, and not alone in business. The "No Connection with Next Door" outlook was an unbusinesslike relic of mid-Victorian stupidity—an era of many business stupidities—an era that was responsible for many of the labour troubles that we were only slowly overcoming even at the present day. To get together and to know one another, and then to work together for the common good, represented one of those "new" discoveries that were as old as the hills. Many trading problems would be solved in a very few moments if that spirit prevailed, without qualification or hesitation, throughout the length and breadth of their industry. The spirit of friendly goodwill that he had discovered during the course of his visits to E.C.A. branches and sections all over the country during the past year, had come as a revelation even to such an incurable optimist as himself. Electrical contractors were standing more closely together to-day than ever before, and important results of that united determination to work together for the general good of the trade were likely to be seen by their membership in the near future. The general relations existing between the members and their local supply engineers had improved out of all recognition, and he was convinced that very substantial benefits had already been achieved by that "revolution of outlook" alone.

Considerable work, however, remained to be done; there was need for someone to make it his business to get all sections to co-operate much more effectively than they appeared to do at the present moment. Various committees were meeting: but *results* were what were required. When they could report something tangible and let all interested parties know that something definite was taking place, then he was sure that they would have more general satisfaction and support from all sections of the trade. Wholehearted co-operation between all sections of the industry was urgently needed to put the industry on a proper footing.

Elliott & Fry] **Mr. W. A. Shaw, A.M.I.E.E.,** *[London*

The Retiring President of the Electrical Contractors' Association.

In his annual report he had outlined the heavy work undertaken by the Electrical Contractors' Association and its allied organisations during the past year. Now it was his desire to review sundry broader questions of general policy that confronted them at the present moment, and to urge the need for serious constructive thought on those problems.

Apart from the better regulation of trading conditions within the electrical industry, did any more serious problem confront them at the present moment than the shoddy workers and workmanship to be found in the electrical installation trade? What were they doing, individually and collectively, to stamp out that serious evil? It was a recognised feature of British procedure for the president's address at such a gathering as that to represent his own personal views on any subjects he might select. He hoped that his hearers would accept those personal observations in the spirit in which they were offered, and discuss them among themselves to the substantial advancement of the trade.

The problems involved were large and difficult, but for those reasons it was all the more necessary that they should be faced immediately. The National Register of Electrical Installation Contractors was formed in order to deal broadly with the existing situation, and it would be agreed that a good deal of success had been achieved by the Register as a direct consequence of the recognition which it had received from a considerable number of electricity supply engineers. There was room, however, for considerable development under this heading—a fact that was recognised very frankly by Mr. F. W. Purse in his presidential address before the recent I.M.E.A. Convention in Bath. Mr. Purse said:—

> "The aims and objects of the National Register are such as to command a *greater* degree of support from supply engineers than is available at the present moment. The National Register can be an instrument of great usefulness in obtaining and undertaking that proper class of wiring which I believe is the desire of all of us."

"Support and encourage Registered contractors in every possible way," Mr. Purse said in conclusion, and he (the speaker) was sure that they all agreed with him in that matter. In his opinion very definite steps might be taken to protect the legitimate electrical contractors against those untrained and incompetent competitors who surrounded them on all sides, and he seriously suggested that everybody engaged in the industry, no matter in what section, should carefully consider more determined methods of urging forward the central objects of the National Register. For example, he would like to express his firm belief in the need for compulsory wiring rules in this country. All sections of the industry should unite with a view to obtaining a compulsory code of wiring rules, providing a standard below which no work would be permitted to be connected to the public mains. Such a scheme would carry with it full authority to electricity supply departments to inspect installation work in progress, and to refuse connection to any work below the given standard. He was convinced that if the two immediately interested sections of the industry made suitable representations to the Electricity Commissioners, there would be a distinct possibility of wiring rules being made nationally compulsory, without waiting for local authorities to be put to the worry and expense of individually applying for powers.

There was no need for him to discuss the national inconsistency which demanded the electrical protection of the worker in his factory and left him exposed to every electrical risk in his own home. He would, however, direct attention to the fact that, thanks to Mr. F. W. Purse's example in West Ham, they were substantially nearer to general compulsory wiring regulations in this country than they were even twelve months ago.

Following the example of many Continental, American and Dominion Governments—in countries exhibiting phenomenal electrical activity—he could not imagine that Great Britain would permit the present "Go as you please" attitude to prevail very much longer in connection with domestic, office and shop installations. The example provided by West Ham and sundry other places, where the wiring regulations of the Institution of Electrical Engineers had been made compulsory, represented a very substantial beginning to a movement that was bound to develop with considerable rapidity in the near future. Recognition of the need for compulsory wiring regulations represented an educational process; and educational processes were always on the slow side—especially when they had to deal with a large number of prejudiced and rather obstinate scholars.

Finally, on the subject of shoddy workmanship, he would direct public attention to the unceasing effort of the Electrical Contractors' Association to raise the status of the trade by fostering in every way the principle of indentured apprenticeship. Electrical contractors in business to-day were morally bound to do everything in their power to attract the best type of boy to installation work, and to provide for his thorough education in the theory and practice of the craft. Only by developing the principle of indentured apprenticeship could they save the trade from falling into the hands of such half-trained workers as were created by the war conditions that prevailed ten years ago. They had seen and experienced the damaging possibilities of half-trained workers in their trade, and the employer was more than blind to his own interests who failed to support the Association's indentured apprenticeship scheme to the utmost of his ability. How could they hope to exclude the incompetent dabbler, and build up the trade on sure foundations of technical competence, unless they attracted the best type of boy into installation work, and gave him that personal interest, and sense of security in his work, that indentured apprenticeship alone could secure?

He wished to emphasise how immensely their whole membership was indebted to those trade-spirited electrical contractors who played a really active part in their orgavisation. The voluntary efforts of the branch and section officers on behalf of the general welfare of the trade were beyond praise or price: while the amount of time and attention devoted to E.C.A. affairs by many of their principal members in London was practically beyond belief.

The Annual Report.

Mr. W. A. SHAW, the retiring president, submitted his annual report to the annual general meeting yesterday (Thursday). He said that the membership had risen to 1,100, and represented all parts of the British Isles. They had enrolled members in new districts, and there was every indication of more substantial progress in the future. During the year sub-branches had been inaugurated at Chesterfield, Eastbourne, Hastings, and Torquay, and the E.C.A. organisation now comprised 28 main branches and 25 sub-branches; arrangements were in progress for the organisation of further sub-branches. The advance was mainly due to the efforts of certain very active members. Copies of the Association's "Year Book" had been distributed to supply authorities, engineers and architects throughout the country, and it was proving a useful publication to all concerned. The Council had considered the advisability of admitting supply companies (as distinct from municipal authorities) to membership; he thought that the inclusion of such companies with wiring departments would be to the Association's advantage. Referring to the discussion by the electrical Press of the question of compulsory registration, Mr. Shaw said that practical progress would be made by advertising the Register, and what it stood for, to the public, and by advocating the adoption of a national code of compulsory wiring regulations. What had they done to bring the principle of registration, namely, the execution of good work, to the notice of the public? Or to give the public even a hint that any real difference existed between the reputable electrical contractor and his shoddy counterpart? There were electrical men who deprecated any mention of danger in connection with electricity, but it was impossible not to refer to it when pointing out the difference between good and shoddy work. Was it possible to guarantee the public a square deal in connection with private installation work? At present neither the Register nor the E.C.A. was truly effective, so far as the public was concerned. It was of no great consequence to the public to know that a Registered contractor might be struck off the roll if he carried out defective work. Was it impossible to develop the idea of a definite guarantee being associated with the E.C.A. membership? The Council felt the need for the education of the public as to the necessity for good workmanship, and a pamphlet was being prepared on the subject for public distribution. Simultaneously with the publication of the pamphlet, electrical signs would be available to the membership as a means of demarcation between members of the Association and those outside. Dealing with apprentices, Mr. Shaw gave the names of the winners of the Association's medals and prizes, and said that a great deal had been done towards securing the indenturing of apprentices; the Western and Irish Sections' apprentices were all indentured. Negotiations with supply authorities had been carried out in a large number of districts, and in the majority of cases had culminated in satisfactory schemes for assisted wiring. In most of these the work was being let out to electrical contractors. In the negotiations, however, they had been hampered by the presence of a multitude of so-called "contractors" with no obligations to the trade whose main object appeared to be to get the work at any price, regardless of the consequences to themselves and others. There was an urgent need, by conference and co-operative agreement with supply authorities, to discover means to counter that oppressive evil. It was impossible to give a full survey of the work of the Statutory Committee set up to advise on the working of the "Agreed Clause" of the 1926 Electricity (Supply) Act. Very useful results were likely to accrue from the more informal "Committee D" which owed its existence to the Statutory Advisory Committee. Committee D had for its terms of reference the possibility of inaugurating a fair trading policy for general use in the industry. Its work was still in the initial stages, and although it was impossible to forecast the results of its deliberations, it was certain that its efforts would bear distinct fruits. The Associations had cause to congratulate themselves upon their strong position as revealed by the balance sheet. They must always be in a position to have money available to protect their interests. In the past they had had to incur heavy expenses to maintain their principles, and it would be a great pity if they ever had to face the position where their interests had to be sacrificed owing to lack of funds. During the year their relations with the Electrical Trades Union had been most friendly; they had cause for gratification in the harmonious working of the two organisations whose views were liable, in many directions, to be so divergent. The old principle of direct action instead of negotiation had, he hoped, received its death-blow so far as their section of the industry was concerned. He desired to make special reference to the activities of certain sub-committees of the London branch. Negotiations had recently taken place with H.M. Office of Works, the London County Council, and other official bodies, which, in his opinion, had been to the good of the membership as a whole. Although some of the problems were confined to London, in many cases the work would be of advantage nationally. In conclusion, Mr. Shaw expressed his thanks for the help received from the chairmen of the main committees of the Council, the branch officials, the General Secretary and his staff, and the editor of *The Electrical Contractor*.

Electricity Supply at Maidstone.

The recently inaugurated extensions at the Maidstone Corporation Electricity Works include a 7,000-kW Brush-Ljungström turbo-alternator, a 60,000-lb. Stirling boiler, and new G.E.C. e.h.p. switchgear.

IN our issue of January 15th, 1926, p. 101, we described extensions which had just been made to the electricity works of the Corporation of Maidstone, at Fairmeadow, which really amounted to the first instalment of what is to be a new generating station. These extensions, which included a 3,500-kW turbo-alternator and new boiler plant, have had considerable influence on the working costs of the undertaking, and have enabled results to be obtained that compare very favourably with some of the large modern power stations in the country. For the twelve months ended March 31st, 1928, the coal consumption per unit generated was only 1.82 lb., while the thermal efficiency of the station for the whole year was 15.9 per cent.

It was soon realised by the Electricity Committee that additional plant would have to be installed, and a scheme of extensions which was prepared by the engineer and manager, Mr. E. E. Hoadley, M.I.E.E., and sanctioned by the Electricity Commissioners in August, 1926, culminated on Wednesday last in the official opening of the second instalment of the new station.

The new extensions comprise additions to the boiler and turbine houses; a 60,000-lb. boiler plant, with auxiliaries; a 7,000-kW turbo-alternator and accessories; and additional e.h.p. switchgear. An extra cooling tower is to be installed at an early date. With these additions the total capacity of the

Fig. 1.—Maidstone Electricity Works.

generating plant amounts to 17,650 kW, of which no less than 16,150 kW is represented by Brush-Ljungström turbines.

The buildings, which were designed by the borough surveyor, Mr. T. F. Bunting, and consist of a steel framework erected on a reinforced-concrete raft and filled in with concrete blocks, have been so extended that a further boiler and a 12,500-kW turbine can be installed at a future date without additional building operations being necessary. The contractors for the concrete work were Messrs. G. E. Wallis & Sons, Ltd., and for the steelwork Messrs. Lambourne, Ltd., and Messrs. Redpath, Brown & Co. Fig. 1 shows an external view of the station as it is at present.

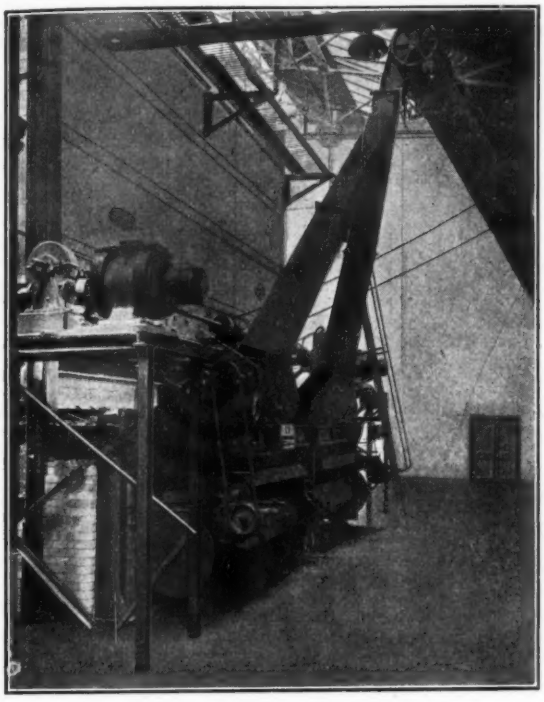


Fig. 2.—60,000-lb. Stirling Boiler.

The new steam-raising equipment was supplied by the Stirling Boiler Co., Ltd. The Stirling boiler, fig. 2, represents the latest development in vertical-boiler construction, and incorporates some interesting features. It has 9,594 sq. ft. of heating surface, and is normally capable of evaporating 60,000 lb. of water per hour to steam at 225 lb. per sq. in. pressure, superheated to a temperature of 700 deg. F., but the liberal proportioning of the plant confers upon it a large overload capacity. The feed-water system consists of two "all-electric" Plurovane high-lift turbine pumps, supplied by Messrs. Mather & Platt, Ltd., each of which is capable of delivering 200 gal. of water per min. against a total pressure of 275 lb., and is driven by a 75-h.p. squirrel-cage induction motor. The feed-water is conveyed from the pumps to a main feed range and thence enters the economiser at a temperature of 100 deg. F.; it is raised to 225 deg. F. before entering the boiler. The two "Bennis" smokeless chain-grate stokers each have an approximate effective grate area of 306 sq. ft., and each grate is driven by a 10-h.p. motor through a 6-speed gearing. The installation also includes one "Sirocco" induced-draught fan, 82,000 cu. ft. per min., and a "Davidson" grit arrestor. The boiler tubes are kept free from external deposit by "Diamond" soot blowers, manufactured by Messrs. Babcock and Wilcox, Ltd. A complete ash-conveying and elevating plant, supplied by Messrs. Ed. Bennis & Co., Ltd., comprises a water-sealed trough conveyor, which deals with the ashes from the two existing Vickers and the new Stirling boilers, with provision for a further boiler. The ashes are conveyed to a bucket elevator by means of which they are dumped into a 15-ton ash hopper, from which they are dropped into carts and lorries. The ash conveyor and elevator complete the cycle of operations by means of which the coal is not touched by hand from the time it arrives alongside in barges in the Medway until it is taken away as clinker. By means of recording instruments a complete check is maintained of the efficiency of the plant.

The turbo-alternator, fig. 3, supplied by the Brush Electrical Engineering Co., Ltd., is of the well-known Brush-Ljungström type, and has an output at the most economical loading of 5,600 kW when supplied with steam at a pressure of 200 lb. per sq. in. and a total temperature of 600 deg. F. at the main turbine stop valve, exhausting into a vacuum of 28½ in. (barometer 30 in.). The turbine is directly coupled to two alternators, 6,600 volts, 50 cycles, 3-phase. The set has a continuous maximum capacity of 7,000 kW and runs at a speed of 3,000 r.p.m. All the main bearings, as well as the governor and thrust block bearings, are lubricated by means of a continuous supply of oil delivered under pressure by a rotary pump of the valveless type. Fitted to the turbine is a powerful automatic governor which controls the throttle valve, through the medium of a pressure relay system, thus giving sensitive and positive governing. The governor can be adjusted at the turbine by hand operation, and also at the switchboard by means of electric control. The condenser is of the two-flow surface type, capable of dealing with 62,500 lb. of exhaust steam per hour. Air is extracted from the condenser by means of a Brush-Delas ejector. This is of the two-stage type, the nozzles being in series and the whole combined to form a simple self-contained unit. The condensate is extracted by means of a Worthington-Simpson two-stage vertical-spindle pump and is delivered through a recorder of the Venturi type to the hot well. The extraction and lift pumps are mounted on a common bedplate and are driven by an 8-h.p. squirrel-cage motor, 1,440 r.p.m., controlled by a floor-mounted oil-immersed star-delta

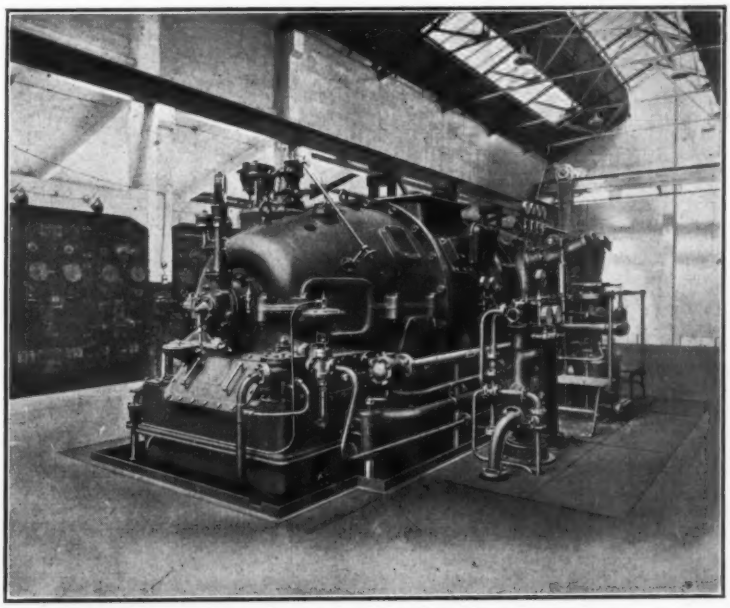


Fig. 3.—Brush-Ljungström Turbo-alternator, 7,000 kW.

starter. The condensing water is delivered by means of a motor-driven centrifugal pump of the "Sunturbo" type, made by Messrs. J. Stone & Co., Ltd. This pump will deliver continuously the requisite quantity of water against a total head ranging from 14 to 40 ft., and is driven by a 65-h.p. motor.

The necessary air for cooling the alternators is supplied by a centrifugal fan, made by Messrs. Matthews and Yates, Ltd. This is capable of delivering 26,000 cu. ft. of air per min., and is directly driven by a 50-h.p. motor. The air is passed through an "A.B.C." oil-type air filter provided with spare cells and cleaning tanks."

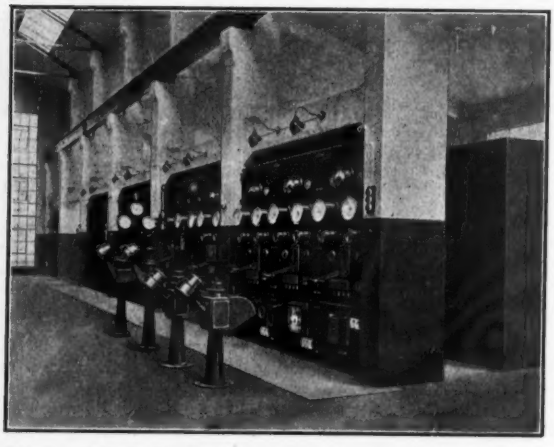


Fig. 4.—G.E.C. Control Board and e.h.p. Cubicles at Rear.

The extensions to the high-pressure switchgear were carried out by the General Electric Co., Ltd. This equipment is of the steel-plate cubicle type, and is operated mechanically from a slate control board, fig. 4, mounted in front of the cubicles. The apparatus is connected to a duplicate set of bus-bars, and controls, in addition to the new machines, two 2,000 kVA alternators and three feeders. The alternator cubicles are equipped with oil circuit breakers of 100,000 kVA maximum breaking capacity, isolating links, instrument transformers, and so on. All the slate control panels are fitted with oil circuit-breaker signal lamps, bus-bar signal lamps, time-limit fuses and ammeters, and the alternator cubicle control panels are equipped with the usual instruments. The tanks of the oil circuit-breakers are constructed of welded steel.

With the new plant it is confidently expected to get a fuel-consumption figure of 1.65 lb. for the present year. It is interesting to recall that in the scheme for the supply of electricity by the Central Electricity Board for the South-Eastern area, Maidstone has been chosen as one of the selected stations, and this may be taken as at least a tribute to the efficient working of the station at the present time.

The domestic lead in Maidstone is being pushed with energy, and a large number of houses now use electricity entirely for lighting, cooking, heating and hot-water supply, with the exception of one coal fire used in the winter time. The wiring of houses and other premises is undertaken on hire and hire-purchase schemes, while cookers, fires, flat irons and hot-water tanks are let out on hire-maintenance at very reasonable rates. The success of the schemes is exemplified by the fact that on March 31st last there were no fewer than 2,485 pieces of apparatus out on hire.

The possibilities of the further extension in the use of electricity in Maidstone are considerable, particularly in the domestic field, while in the area around the town, comprising some eighteen parishes in which the Corporation has obtained the rights to supply, demands are springing up in all directions.

The Joint Use of Poles for Power and Communication Lines.

The Present Position in the United States.

WE have received the following communication from Mr. J. C. Martin, of Wilmette, Illinois, U.S.A.:—

The writer has read with a great deal of interest in your issue of March 23rd, 1928, the account of the Overhead Lines Association meeting at which Mr. E. S. Byng discussed the problem of the joint use of poles. Apparently Mr. Byng is not familiar with the later history of this problem in the United States. The specifications referred to as adopted by the National Electric Light Association and the American Telephone and Telegraph Company are no longer recognised by the National Electric Light Association, its recognition having been withdrawn along with similar recognition of other specification dealing with overhead-line construction several years ago. This was the result of a rather long-drawn-out argument in which the question of voltage limitation was the prominent feature.

The sentiment of the light and power people in the United States is that the older forms of joint-use agreements and specifications built on a voltage limit are unsatisfactory from their standpoint. The argument over this problem continued for some time prior to 1910 to February 15th, 1926, when a set of "Principles and Practices for the Joint Use of Wood Poles by Supply and Communication Companies" was adopted. This is a "Report of the Joint General Committee of National Electric Light Association and Bell Telephone System on Physical Relations between Electrical Supply and Communication Systems" formed originally to consider the problem of inductive co-ordination and on which it is actively engaged at present.

These "Principles and Practices" recognise that as duties "each party should—

"(*a*) Be the judge of the quality and requirements of its own service, including the character and design of its own facilities.

"(*b*) Provide and maintain facilities adequate to meet the service requirements, including such future modifications in these facilities as changing conditions indicate to be necessary and proper.

"(*c*) Determine the character of its own circuits and structures to be placed or continued in joint use, and determine the character of the circuits and structures of others with which it will enter into or continue in joint use.

"(*d*) Co-operate with the other party, so that in carrying out the foregoing duties proper consideration will be given to the mutual problems which may arise and so that the parties can jointly determine the best engineering solution in situations where the facilities of both are involved."

The foregoing is only a partial quotation. Forms of agreements and specifications that will comply with the "Principles and Practices" are in progress of being worked out. It is the hope of those actively at work on the problems that these will be so flexible that any specific problems which arise can be met on their merits, and that the protection of all parties will be found in the principles enunciated above.

Mr. Byng, if the published report is correct, is confused on the specifications he refers to and ties into the National Electrical Safety Code; also, in his reference to the American Engineering Standards Committee's interest in the matter.

The Standards Committee has taken no part in this discussion. It has adopted as a national standard the National Electrical Safety Code which includes material dealing with joint construction. The only specifications in existence to-day are the older ones, including a voltage limitation. Mr. Byng evidently refers to these. In so far as they go they agree in their main physical details with the Safety Code. The Safety Code, however, does not impose a voltage limit for joint use and does provide construction for joint use at all voltages.

The problem in the United States at the present time is to

what extent joint use is economical measured by the service results to the public from the standpoint of all parties. If joint use were without restrictions it is fair to assume that it would reduce the investment and maintenance costs in so far as poles are affected. If it places service restrictions on either party the public may lose because of those restrictions in service.

Rural service, the serving of small communities from transmission systems with the minimum number of transformations to protect voltage regulation and save energy losses, and the increasing load density in congested areas, are all causing an increasing use of distribution voltages higher than 5,000, the limit that signal and communication companies have felt is essential from the viewpoint of their system insulation and protective device characteristics. The position of light and power companiees is that they cannot afford to bind themselves under contract by such limitations, even though they have been accepted in some instances under past conditions. There is no disposition to question the duty of the signal and communication people to determine the policy so far as their own systems are concerned. The light and power people do not believe that they should be asked to limit the development of their own practices, and take the position that their duty to determine their own policies is the same as that of the signal and communication interests.

The "Principles and Practices" referred to are an honest and co-operative effort on the part of the two interests principally concerned to face and solve each problem on its merits and avoid injury to the public by curtailment of service through hard and fast policies. The co-operative effort is based on the public rights to utility service. Each utility must decide for itself what is best in a specific situation. The best engineering and economic solution under the conditions set up must then be found and applied. It may involve joint use or separate lines, or it may involve abandoning joint use that has been in existence because the changed conditions make it inadvisable from an economical service standpoint for either or both parties. Whatever the solution may be, it must be found.

Mr. Byng is decidedly in error in his statement that "electricity supply companies agreed to put their main feeders under ground, simply using the overhead routes for distribution to the consumers." Underground systems in the United States are confined almost entirely to the congested areas of the larger cities. Combined underground and overhead distribution is utilised to a limited extent in a few cities, but rather as a tie between the two types of system, or a step forward complete underground systems in areas whose growth is such that an underground system is the logical future service arrangement. There are a few smaller cities in which complete underground distribution is not feasible where the main feeders in the business districts are put underground and overhead secondary lines in alleys or side streets are used. These cities are not able to stand the investment in a complete underground system and the combination is utilised to clear the poles and wires from the principal business streets. In no case is the problem of joint use of poles a primary factor in the adoption of the system. The primary factor is the necessity of clearing heavy pole lines from congested streets already overburdened with travel and other facilities that naturally utilise these streets.

The problem of joint pole use in the United States is complicated by the rapid growth of light and power and the signal and communication systems. Hard and fast contracts and specifications have proved unsatisfactory. We are now trying to face the problem on a new basis, as is indicated in the "Principles and Practices" referred to. However, it must be understood that these involve only the light and power group and the Bell system, though covering the major portion of the parties interested. The telegraph companies have only a very small amount of joint use with little probability of a material increase. The independent telephone companies are generally located in territories where the problem of joint use is not an urgent one.

A copy of this letter has been forwarded to Mr. E. S. Byng, whose reply follows:—

We are indebted to Mr. J. C. Martin for his interesting contribution on the question of joint use. It is well known that for the last two or three years there has been an increasing tendency for electricity supply companies in America to raise the voltage of their primary circuits, and that, in consequence, the limitations previously agreed upon might require some modification. In Great Britain the supply companies have not hitherto adopted overhead distribution to any great extent, but the extension of electrification into rural areas will tend largely to increase the amount of overhead plant. Under such conditions, co-operation between the parties concerned is necessary if a conflict of interests similar to that which existed for many years in America is to be avoided.

The success of co-operation in America makes the study of existing specifications of considerable value to engineers in Great Britain, especially as the same general constructional methods will, presumably, be adopted in the revised agreements and specifications which Mr. Martin indicates are now being worked out. Mr. Martin makes certain quotations from the 1926 Report, but, in addition to these, the Report states that "it is recognised that there are very substantial advantages to both utilities in the employment of jointly-occupied poles where the conditions and character permit." Again, "it is recommended that joint use should be entered into in preference to separate pole lines on the same street or highway where the combination of circuits is such as to make further co-operative studies of the problem unnecessary, and in other cases where a co-operative study shows that joint use is economical, and is the best engineering solution."

The adoption by the Standards Committee of the National Electric Safety Code as a national standard appears to indicate the Committee's interest in the question, although it refrained from participating in the actual discussions between the utility companies concerned. The rules cover in a general way the installation and maintenance of electricity supply and communication lines, though, as Mr. Martin points out, voltage limits are not imposed, but are fixed by agreement between the interested parties.

The placing of main feeders underground is, I agree, largely a matter for decision upon economic grounds. In rural areas and in the smaller cities it may not be advisable to adopt underground construction. My remarks, however, applied to congested areas in the larger cities where overhead wires previously were used and, together with the duplicated routes of telephone circuits, gave rise to many of the differences of opinion. These difficulties were, it is understood, largely overcome by placing the power circuits underground and the telephone circuits either in aerial or underground cable, joint use being adopted for overhead distribution where necessary. The problem in this country is not quite parallel, since underground work has been adopted generally, for æsthetic rather than economic reasons.

There is, I think, nothing in Mr. Martin's letter which is opposed to the principal contentions of the lecture as reported in the article in question. These were: (1) that practically the whole of the distribution work in America is now based upon the joint-use principle wherever circumstances so dictate; and (2) that the same principle should be followed in the overhead power distribution schemes now being planned for Great Britain.

Magneto Exploders for Mine Shot-Firing.

Recent research has shown the need for the provision in magneto exploders of a "safety" device which shall render any spark which might pass between the two ends of, or at any defect in, the firing cable incapable of igniting firedamp, and yet, of course, shall still leave sufficient current to ensure reliable firing of the detonator. This need arises mainly in respect of the single-shot exploders which are used to fire charges of "Permitted" explosives in coal mines where danger may arise from firedamp or coal dust. Arrangements have therefore been made at the Mines Department Testing Station, Sheffield, for testing single-shot exploders, and the Mines Department is prepared to issue a certificate in favour of instruments that comply with the requirements laid down in the appendix hereto. A fee of £5 will be charged for testing each type of exploder. Application for the test of a magneto exploder should be made by letter, accompanied by the prescribed fee, to the Under Secretary for Mines, Mines Department, Dean Stanley Street, Millbank, London, S.W.1.

The Secretary of Mines announces that in accordance with the arrangements above mentioned, he has issued a certificate in favour of Messrs. John Davis & Son (Derby), Limited, Derby, whose exploders described as "Davis" H.T. Exploder No. 1 X, and "Davis" L.T. Exploder No. 15 X, have now passed all the prescribed tests.

Steel Buildings Erected by Arc Welding.

According to Professor Frank P. McKibben, consulting engineer, of Black Gap, Pennsylvania, U.S.A., with the aid of electric welding structural steel columns and girders can be built in such a manner as to eliminate the principal source of noise—the riveter. The electrically created structure is not an experiment; its design can be calculated in advance, as is evidenced by the existence of over 25 steel buildings now in use which have been welded, including railroad bridges. Among these buildings is included one recently compiled by the American Bridge Company for the West Philadelphia plant of the General Electric Company, U.S.A. This structure, covering 80,150 square feet of ground and composed of 989 tons of steel, is said to be the largest steel structure thus far welded. It required only two men to weld the steel columns, beams, and trusses together at the building site, after the erectors had assembled the pieces preparatory to welding.

The structure is approximately 140 feet wide, 600 feet long, and 50 feet high. Seven of the welded roof trusses have a span of about 72 feet, 20 a span of about 58 feet, and 20 a span of about 80 feet. Work was first started on January 11th, 1928, and the structural framework was completed by March 1st.

Using structural steel that would otherwise have been scrapped, the Dallas Power & Light Company has erected at Dallas, Texas, U.S.A., a 40-car welded garage for the protection of employés' cars, at a total cost of but 25 per cent. of the lowest contract price for an equivalent riveted structure. The steel was salvaged from the framework of an outdoor switching structure which became obsolete.

In a paper by Mr. A. M. Candy, read before the American I.E.E. last February, it is stated that a riveted girder weighing 798 lb. carried a load of 68,900 lb., whilst a girder of welded plate weighed 656 lb. and carried 78,000 lb. A welded steel railway bridge was built with a saving of one-third of the weight of steel required for riveted construction.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Electrical Review Index.

The index to Vol. CII (for the half-year ending June 30th, 1928) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Municipalities and Foreign Plant.

In our issue dated February 10th, 1928, page 236, under this heading, we summarised at some length a document which had been published by the British Electrical and Allied Manufacturers' Association, entitled "Foreign Plant in British Power Stations; the Case for Support of National Production." In this pamphlet the writer dealt with the Edinburgh contract which was placed in Switzerland, also what had happened in connection with orders from Newport and Stockport. In the REVIEW for February 17th (p. 284), and February 24th (pp. 328 and 330) we reported under the same heading statements emanating from councillors and engineers at Edinburgh, Stockport, Newport, and York.

According to the *Scotsman* of June 26th and various provincial newspapers, the matter came under public notice at Edinburgh on June 25th, when a letter was submitted to the Electricity Committee there from the honorary secretary of the Incorporated Municipal Electrical Association, in which it was pointed out that the B.E.A.M.A. pamphlet contained statements regarding certain municipal electricity undertakings which were found to be based on incomplete data and in consequence a wrong impression had been created in the minds of the public. The *Scotsman* report says:—"The Council of the I.M.E.A. made representations to the Manufacturers' Association, and as a result it expressed its regret and withdrew the publication from circulation. The B.E.A.M.A. has further stated that, to prevent the possibility of a similar occurrence arising in the future, the I.M.E.A. will be consulted before any publication which might possibly adversely affect their members is issued."

A Factory Lighting Campaign.

We learn from Lieut.-Col. W. A. Vignoles, Director and Secretary of the British Electrical Development Association, that an intensive campaign, to be known as the Factory and Workshop Lighting Campaign, has been planned by the E.L.M.A. Lighting Service Bureau, and will be conducted by the B.E.D.A. Its object is to secure better lighting in factories and workshops throughout the United Kingdom. Preliminary particulars in outline will be available shortly, and a handbook will be issued describing the general plan in detail. The basis of the campaign will be postal communications to the executives of factories and workshops throughout the country, thus getting right home to those who are actually interested in the subject. A survey was made last year of a number of factories, and this showed that the lighting was very indifferent, and that considerable improvements could be made with advantage. The proposed campaign will, we hope, powerfully influence things in that direction.

Australian Tariff Inquiry.

Among further evidence heard by the Commonwealth Tariff Board, which is inquiring into the effects of the duties upon heavy electrical apparatus, was that of Mr. W. H. Myers, chief electrical engineer of the New South Wales railways and tramways. Mr. Myers said that the Railway Commissioners and their responsible officers could not possibly take the responsibility, in many cases, for the purchase of comparatively untried locally-manufactured machinery or equipment, even when the prices of the tenders appeared to be, otherwise, very satisfactory. Machinery purchased by the department from local manufacturers had sometimes proved defective, after a comparatively short time of operation, and as a result large numbers of men had been thrown out of employment through the consequent failure of the power supply. The time was not yet ripe for Australia to take up the manufacture of turbo-alternators, and the local manufacturing firms should concentrate on the gradual building up of those manufactures which offered a far greater field for local development.

At a later stage of the proceedings, reports the *Sydney Morning Herald*, Mr. Forbes Mackay, general manager of the Sydney Electricity Department, was asked to explain a resolution adopted by the Civic Commissioners in April last declaring that the Council would bear the cost of "dumping" duty (if any) imposed by the Customs Office on items of plant imported from overseas, and that the Council's form of contract should be amended to that effect. Witnesses had urged that this resolution would undermine the Customs Tariff Industries Preservation Act and could only be construed as an open invitation to overseas manufacturers to trade illegitimately.

Subsequently, Mr. Mackay put in the following statement: "If tenders were to be called which definitely required the tenderer to bear the dumping duty, the tenderer would necessarily increase the amount of his tender by such an amount as he thought he would have to pay in dumping duty. In that case, the Sydney electricity undertaking would have to bear the amount of dumping duty as a part of the total sum paid under the contract. Under such a system, if it should so happen that when the goods arrived in Australia the dumping duty was not imposed, the electricity department would still have to pay the amount included in the contract price as provision for dumping duty, and it is that which the Commissioners desire to avoid. The City Commissioners desire to receive tenders in such a form that the firm tendering, and the Commissioners, will each know precisely what the liability is to be, and to ensure that only the precise amount of the dumping duty, without any addition, is added to the cost of the goods."

Conditions in the United States.

In his speech at the recent annual meeting of the Westinghouse Electric & Mfg. Co., the president (Mr. E. M. Herr) said that business conditions in the United States had not changed materially for several months. There was perhaps at present a slight droop in volume, but that was offset by indications that as soon as the presidential nominating conventions were over the volume would increase. He looked for a rather good business year, not materially better than last year, but with a sufficient improvement in view to warrant confidence. The electrical industry was in a most fortunate position, for it had a continuous development that ever broadened its field of usefulness. Those new fields created new electrical markets and so continued the steady growth of the industry at times when business in more staple products might be slightly under normal.

Recent Contracts.

Messrs. HAGGERTY, LAWRANCE & Co. inform us that they have recently received an order from the London County Council Tramways for four "Bull" arc-welding sets, for use in connection with tramway maintenance. Two of the sets are of the stationary type, and the remaining two sets are fitted with wheels for road haulage. All the machines are of 200-A capacity, continuous rating.

The CAMBRIDGE INSTRUMENT CO., LTD., has recently received a number of important orders for its thermometer and pyrometer equipment. Among the undertakings represented are the Moredon power station, Swindon, the Barking power station, the Buenos Aires Western Railway, the Manufactures des Glaces and Produits Chimiques de St. Gobain, an Argentine power station and the Shanghai municipal power station.

Coal and Steel Production and Rates.

Speaking at the annual meeting of John Brown & Co., Ltd., last week, Lord Aberconway (chairman) said that every ton of steel that left the company's Sheffield works carried £2 per ton in local rates. This year it was actually 30s., but practically, having regard to prices and one thing or another, they represented about the 40s. per ton of a few years ago. That was a terrible burden. They were handicapped by the cost of social services, which came out of local taxation—a burden they had borne without complaint for some years. He was glad to think that the legislation proposed by the Chancellor of the Exchequer was going to relieve them of three-fourths of those rates, so that if the local rates were £40,000, as they had been, £30,000 would be taken off their shoulders. The same applied to collieries, blast furnaces and by-product works.

The new chairman of Guest, Keen & Nettlefolds, Ltd. (Sir John F. Beale, K.B.E.), addressing the shareholders on June 27th, said that they were looking to the Government's proposals for material relief to the collieries in their fight to regain the world's markets. In his opinion, it was a bold and statesmanlike scheme, but he feared that if the relief was deferred until the latter end of next year, as at present proposed, many of the weaker companies might not be able to stand the strain. The serious consequences of delayed action had been represented to the Government, and he felt sure that if it was at all possible for it to expedite its plan, so far as the

collieries were concerned, it would do so. The coal trade itself was doing what it could by co-operative means to avoid useless internecine competition when selling coal abroad. There were many complicated details to be overcome, but he was hopeful that a satisfactory solution was in process of being found, and that ultimately the export coal trade would surmount the impossible conditions of the past few years.

Bankruptcy Proceedings.

S. J. SEWELL and W. L. BROWN, trading as Sewell and Brown, electrical and radio engineers, Muswell Hill, N.—These debtors attended before Mr. Registrar Mellor at the London Bankruptcy Court on June 27th for public examination upon accounts showing liabilities of £1,084, against assets valued at £357. The debtors stated that they entered into partnership in 1926, and began trading from a lock-up shop at Muswell Hill. They borrowed £300 from Brown's father. They traded successfully, and in March, 1927, rented additional premises, to which they transferred the business, and converted the original premises into an accumulator charging station. In June, 1927, they were compelled to borrow further moneys to enable them to meet current expenses, and since that date they had been in difficulties. Several judgments were made against them, and they eventually presented their own petition. The debtors attributed their insolvency to lack of working capital, depression in trade, and to the profits having been insufficient to meet overhead charges and the drawings of partners. The examination was concluded. The following are creditors :—

	£		£
Castellina Co., Ltd. ...	44	Mariophone Co., Ltd. ...	46
Falk, Stadelmann & Co., Ltd.	97	Medlock, J. G.	21
Brown, W. G.	428	Wenham Lighting Corpn.	32
Hart Accumulator Co., Ltd.	20	Midland Bank	56
		Rent	57
		Rates, &c.	30

P. FORD, 4a, Macdonalds Lane, Corporation Street, Manchester, electrical contractor.—The application for the discharge of this debtor was heard on June 25th at the Court House, Manchester, when the discharge was granted subject to a suspension of four months. The Official Receiver stated that a first and final dividend of 11½d. in the £ had been paid on proofs for £1,318. The debtor commenced business on his own account, after being in partnership, with £130 lent him by his father, but owing to general bad trade conditions, inadequate capital, and the coal strike, the business was unsuccessful. With regard to a sum of £450 a year for household expenses of the debtor and family, it was stated that part of this sum had gone to supplement the wages of ex-service employés who were suffering by shortage of employment, and in the light of this explanation, the debtor was granted his discharge as stated above.

W. A. HAMMOND, 31, Middle Street South, Great Driffield, Yorks., wireless dealer.—The public examination of this debtor was held on June 25th at the Guildhall, Hull, when a statement of affairs presented showed liabilities of £378, against net assets of £305, leaving a deficiency of £73. Debtor stated that in November, 1925, he commenced trading as a wireless dealer with a capital of £20, and in March, 1927, he purchased the premises for £150, paying £50 down, of which he borrowed £40 from his father. He was unaware of his position until he was pressed by creditors. The debtor attributed his failure to want of capital, having to give extended credit, and creditors' law costs. The examination was closed.

W. T. LACEY, electrical engineer and contractor, 10, George Street, Bath.—Receiving order made June 22nd, on debtor's own petition.

A. B. GREGORY, wireless expert, 29, St. Albans Road, Seven Kings.—First meeting held July 5th at 29, Russell Square, W.C. Public examination, August 1st, at the Shire Hall, Chelmsford.

W. J. BEATTY, electrical and wireless dealer, 79, Station Road, Ashington, Northumberland.—First meeting held July 5th, at the Official Receiver's office, 81, St. Mary's Place, Newcastle-on-Tyne. Public examination, August 23rd, at the Court House, Newcastle-on-Tyne.

H. A. PRATT, electrical engineer, Essex House, Lee Road, Dovercourt.—First and final dividend of 2s. 1d. in the £, payable at 9, Arcade Street, Ipswich.

C. S. HILL (Sanderson Hill & Co.), Waltham Chambers, Waltham Street, Kingston-upon-Hull.—Receiving order made June 26th, on debtor's own petition.

G. B. BANKS (Redditch Radio Co.), radio engineer, 16, Market Place, Redditch.—First meeting July 9th, at the Official Receiver's office, 191, Corporation Street, Birmingham. Public examination July 25th, at the Court House, Birmingham.

J. R. MARTIN, electrical engineer, 11, Middlesbrough Road, South Bank, York.—Trustee, Mr. C. L. Townsend, Official Receiver, 80, High Street, Stockton-on-Tees, released June 20th.

C. A. W. WILSON, electrical engineer, Wepre, Higher West Cross Lane, Swansea.—Trustee, Mr. H. Rees, Official Receiver, Government Buildings, St. Mary Street, Swansea, released June 22nd.

Company Liquidations.

ELECTRICAL SUPPLIES (LIVERPOOL), LTD., electrical and wireless dealers, Liverpool.—A meeting of creditors was held on June 27th at Liverpool, when Mr. R. R. Bailey (Messrs. Bailey, Page & Co.), reported that he had been appointed receiver on June 6th last, and two days later the company had gone into voluntary liquidation and he had been appointed to act as the liquidator. A statement of affairs was presented which showed liabilities of £3,984, all due to unsecured creditors, and net assets of £1,736, leaving a deficiency as regarded the unsecured creditors of £2,248. The issued capital of the company was £9,720, so that the total deficiency amounted to £11,968. The company was formed in 1918 with a nominal capital of £15,000, all of which had been issued. The company did not actually commence operations until a year after formation. For the year to January 31st, 1920, there was a turnover of £21,172, on which there was a gross profit of £3,452 and a net profit of £830. For the following year, there was a net profit of £799 on sales of £40,083. For the 12 months to January 31st, 1922, the turnover was £19,018, the gross profit fell to £1,392, and there was a net loss of £2,849. In the next year the sales were £23,687, and the net loss £1,415. For the year to January 31st, 1924, the takings were £21,260, and the net loss £1,599, while in the following 12 months the turnover was £21,467, and the net loss £2,163. In the year to January 31st, 1926, the turnover was £17,747, and the net loss £464, and for the next year the net loss was £727, on a turnover of £17,228. During the year to January, 1920, a dividend of 20 per cent on the ordinary shares was paid, and in the following year the dividend was 10 per cent. Debentures were issued for cash advanced in 1920. No accounts had been prepared for the period ended January 31st last, but the deficiency of £11,967 was accounted for by the debit balance on January 31st, 1927, amount written off fixtures, depreciation of stock, bad debts, and estimated loss on trading since January, 1927, £1,040. The creditors decided that the voluntary liquidation of the company should be continued subject to Mr. P. S. Booth, Exchange Chambers, Bixteth Street, Liverpool, being appointed to act as joint liquidator with Mr. Bailey. An advisory committee was also elected, consisting of the representatives of Messrs. Corfield & Cripwell, the General Electric Co., Ltd., and the Greengate & Irwell Rubber Co., Ltd. The principal creditors are :—

	£		£
General Electric Co., Ltd.	1,006	Edison & Swan Electric Co., Ltd.	120
British Thomson-Houston Co., Ltd.	294	Liverpool Electrical Cable Co., Ltd. ...	114
Philips Lamps, Ltd. ...	229	Callender's Cable and Construction Co., Ltd.	120
Sanders & Co.	146	Greengate & Irwell Rubber Co., Ltd. ...	496
Henleys, W. T., Telegraph Works Co., Ltd.	141		

AUTOMOBILE ACCESSORIES (BRISTOL), LTD., 17, Redcliff Street, Bristol, manufacturers of, and dealers in, radio appliances.—The first meeting of creditors was held on June 27th at the Official Receiver's offices, Bristol. It was stated by the Official Receiver that the winding up order was made on May 24th last on a petition presented by creditors. The company was incorporated in December, 1923, its objects being to acquire the business of dealers in motor-car accessories carried on at 93-95, Victoria Street, Bristol. The business carried on by the limited company had latterly been that of manufacturers of, and dealers in, wireless appliances. Under the agreement for sale the company agreed to pay the vendors of the business £1,700 to be satisfied by the allotment of fully paid shares. The company had depôts for the sale of its goods at Exeter and Castle Cary, and a branch shop at Poole and later at Bournemouth. The issued capital amounted to £6,248, in £1 shares. Failure was attributed to want of capital and curtailment of credit. According to the statement of affairs presented, there were liabilities of £4,821 against gross assets of £3,806, and after satisfying the claims of the debenture holders and preferential claims, there were net assets of £285. The Official Receiver said that the circumstances under which the debentures were issued recently by the company would have to be inquired into. Mr. A. Taylor (Messrs. Hudson, Smith, Briggs & Co.) was nominated for appointment as liquidator, and an offer to pay the creditors 5s. in the £ was deferred for the consideration of the liquidator and committee of inspection.

ALLAN CLEAVER & CO., LTD., Holborn Viaduct, E.C.—The statutory first meetings of the creditors and shareholders of this company were held on June 27th, before Mr. J. B. Thompson, Official Receiver, at Carey Street, W.C. According to the chairman's statement the company was incorporated as a private company on February 21st 1923, to acquire the import and export business of A. J. Cleaver. The purchase price was agreed at £750, the company taking over the liabilities and assets. The nominal capital was £1,500, of which £1,150 was issued. In April, 1923, Mr. Henry Kater (a director) went to Germany and purchased a large quantity of headphones which the company was able to market at a profit of 1s. 6d. each; they could not be obtained in sufficient quantities, however, and the gross profit was insufficient to cover overhead expenses. At the end of 1925 the company made arrangements with Telephone Fabrik Berliner for the sole English agency of a special lightweight headphone. Orders were placed for thousands of these goods, and the business transacted proved remunerative. Unfortunately, the German company could not keep the agreement regarding the sole agency, with the result that the English market

became flooded with headphones and the company encountered strong competition. A number of dealers were engaged in a long firm fraud concern, and put a very large quantity of goods on the market at prices ranging from 1s. 6d. to 3s. per headphone less than the price at which the company could afford to sell them, with the result that heavy losses were sustained, and the company's wireless business came to an end in 1926. The failure was attributed to various causes, but, in the opinion of the Official Receiver, it was due to the almost complete lack of knowledge on the part of the directors. No accounts had been lodged in time for the meeting, but the chairman stated that the liabilities were estimated at £16,500 and the assets consisted of shares and claims the value of which could not be ascertained at present. In the absence of any resolution, the liquidation was left in the hands of the Official Receiver.

ERITH ELECTRICAL CONTRACTORS, LTD., electrical and wireless engineers, Erith, Kent.—The statutory meeting of creditors was held on June 29th, at the offices of Mr. L. G. Darling, 87-89, Aldgate High Street, London, E. According to the statement of affairs, the liabilities amounted to £149, and the assets, consisting of stock and book debts, were estimated to realise £76. No resolutions were passed by the creditors, and consequently the voluntary liquidation of the company will be continued, with Mr. Darling as liquidator.

RUTH'S STEAM ACCUMULATORS, LTD.—Winding up voluntarily. Liquidator, Mr. A. J. T. Taylor, Africa House, Kingsway, W.C. A meeting of creditors was held on July 5th, at Africa House. Particulars of claims by July 31st. (This notice is purely formal, as all creditors have been or will be paid in full.)

HANDCROSS ELECTRICITY CO., LTD.—Winding up voluntarily. Liquidator, Mr. A. R. Thompson, The Market Hall, Redhill, Surrey.

PEARL ELECTRICAL CO., LTD.—A meeting of creditors is called for July 7th, at 72, Finsbury Pavement, by the liquidator, Mr. A. W. Archibold.

BESSCARR (DONCASTER) ELECTRICITY SOCIETY, LTD., Register No. 9866R, Yorks., is dissolved by instrument registered June 22nd, unless within three months cause is shown to the contrary.

Private Arrangements.

CEDRIC LEE-BAPTY, trading as the Wireless Instrument Manufacturing Co., Avenue Road, N.W.10.—A meeting of creditors was held on June 26th, at the offices of Messrs. Sunderland, Mountstephen & Co., 15, Eastcheap, E.C. The statement of affairs submitted showed liabilities of £989 and net assets of £379, leaving a deficiency of £559. Mr. O. G. Sunderland said that the assets had been valued on the basis of a going concern, and at a forced realisation would not produce anything like the figures at which they appeared in the statement. The debtor was originally in the cotton trade, and took over his present business in September, 1923. He had a capital of £150, with which he purchased plant, &c. Proper books of account had been kept, and balance sheets prepared. There was a contingent liability in respect of an accident to an employé; a claim of £75 had been notified, but no action had been taken. The trading figures from January, 1926, to June 9th last showed purchases of £1,601, against sales of £5,654, whilst the wages paid were £2,896. After allowing for the expenses there was a net profit of £56, and the drawings were £570. The last two or three balance sheets showed that the business had been carried on at a small net profit. The debtor was unable to submit any offer, and owing to pressing creditors, a deed of assignment had already been executed. Mr. P. Houstoun said that there was a prospect of the business being continued at a profit, and it was possible that the debtor might induce his friends to help him to purchase the assets from the trustee. A resolution was passed confirming the deed of assignment already executed to Mr. O. G. Sunderland, and a committee was appointed, consisting of the representatives of Messrs. Read & Co., G. L. Scott & Co., Ltd., and William Sleath. The following are creditors:—

	£		£
Baxter & Caunter, Ltd.	33	Sleath, G.	32
Baltic Scandinavian Trade Review	45	Scott, G. L., & Co., Ltd.	54
Lowenadler, F. W. ...	61	Bankers	166
Read & Co.	93	Shaw, J.	25
Righton, H., & Co., Ltd.	10	Tibbles, D. C.	200

J. P. DIGBY & PARTNER, Corn Exchange, Burgh Quay, Dublin, wireless and electrical wholesalers.—A meeting of creditors was held on June 25th at the offices of Messrs. Hays, Akers and Hays, 1, Queen Victoria Street, E.C., when Mr. F. Gardiner (Wireless and Radio Trades Guardian Association) representing Messrs. W. G. Pye & Co., the largest trade creditors, presided. Mr. Shott, accountant, presented a statement of affairs which showed liabilities of £6,808, and net assets of £4,151. Mr. Shott said that the business had been carried on since 1916, and the partners at the commencement were Mr. Maccleay and Mr. Digby. Recently another partner was taken in, but there was no fresh agreement. It was understood that a proposal was to be made whereby the business should be formed into a limited company and fresh capital would be introduced by the new partner. That did materialise, however, and the new partner was not with the firm very long. From 1916 to August, 1927, the accounts showed that very little profit or loss was made, but there had since been a loss of about £2,500, which represented more than the capital. During the last few months, goods had been sold at unremunerative prices, and goods had not been purchased properly. When the last partner retired from the business, Mr. Maccleay and Mr. Digby dissolved partnership, and Messrs. Craig, Gardner & Co. were appointed receivers on May 23rd last. Mr. P. Houstoun said that an item of £1,800 put down as "loan account" was really money put into the business to provide additional capital. He would not agree to any private arrangement, unless the amount was withdrawn. Questions were asked with regard to another concern which was carried on in Belfast, and as to whether there would be any surplus arising from that estate. The accountant said that the business referred to had already been liquidated, and the surplus was about £9. Dealing with the separate estate of one of the partners, he said that the liabilities were about £10,000 and the assets were £90. The partnership estate showed something like 12s. in the £, but if the loan creditors were excluded, the creditors should receive something like 16s. in the £. If the estate were dealt with under an assignment, the creditors should get at least 15s. in the £, and probably more, if the book debts realised satisfactorily. Mr. C. Latham was appointed joint trustee with Mr. Shott, conditional upon the cash claims of £1,800 being withdrawn. A committee of inspection was also nominated consisting of the representatives of Messrs. W. G. Pye & Co., Siemens Electric Lamps & Supplies, Ltd., Mr. P. S. Booth, Mr. W. A. J. Osborne, and Mr. O. Sunderland. The following are creditors:—

	£		£
Standard Telephones and Cables, Ltd.	77	Walker, A.	50
British Thomson-Houston Co., Ltd.	55	Fonteyn & Co., Ltd. ...	101
Telegraph Condenser Co., Ltd.	78	Burton, C. F. & H. ...	36
Clement Manufacturing Co.	24	Englebert Tyres (Ireland), Ltd.	158
Wasdell, Ltd.	25	Oldham & Son, Ltd. ...	365
Siemens Bros. & Co., Ltd.	57	Brown Bros. (Ireland), Ltd.	107
Heilbron, Felix	152	Igranic Electric Co., Ltd.	376
London Electric Wire Co. & Smiths, Ltd. ...	38	B.N.B. Wireless, Ltd. ...	28
Brown, S. G., Ltd. ...	166	Siemens Electric Lamps and Supplies, Ltd. ...	448
Chloride Electrical Storage Co., Ltd.	56	Hunt, A. H., Ltd. ...	534
Mullard Wireless Service Co., Ltd.	131	Marconi (Ireland), Ltd....	277
Pye, W. G., & Co. ...	557	Maudaw Co., Ltd., and Wolff Bros.	67
Warne, Wright & Rowland	28	Fankhauel & Kingsley ...	42
Lucas, Jos., Ltd. ...	33	Redfern Rubber Co., Ltd.	42
Cossor, A. C., Ltd. ...	20	Wood, T. & J.	34
		General Electric Co., Ltd.	119
		Kelly & Shiel	29
		Rowland & Harris ...	52
		Walworth	73
		Commercial Insurance Co. of Ireland	55

J. & E. HILLER, trading as Hiller Bros., 52, Whitechapel Road, E.1, electrical engineers, wireless dealers, &c.—A meeting of creditors took place on June 29th, at the office of Mr. James Mortimer, 12, Coleman Street, E.C., when the chair was taken by the representative of the Marconiphone Co., Ltd., the largest trade creditors. A statement of affairs was submitted by Mr. Mortimer, which showed liabilities of £951 and net assets of £152, leaving a deficiency of £799. The debtors commenced business as electrical and radio engineers in November, 1925, with a joint capital of £130, having previously carried on business from a private address. They took premises in Whitechapel Road. They bought a large stock of electrical goods, but these were found to be unsuitable for the locality, and they had to be disposed of below cost, involving them in a loss of about £200. The debtors would have made satisfactory progress if they had been equipped with better facilities as regarded capital, and the present position was attributed to bad trade, pilfering, &c. Various creditors were suing, and for the protection of the estate a deed of assignment had been made with Mr. Hawkins as trustee. On March 1st, 1927, there was an excess of liabilities over assets of £236, and the net loss of carrying on the business from March 1st, 1928, to June 27th, 1928, was £227. From March 1st, 1927, to February 29th, 1928, a gross profit of £1,172 was earned, and there was a net profit of £401. It was impossible for the debtors to carry on with any hope of success because they had so little capital. They offered a composition of 4s. in the £, and they had secured two persons who would guarantee the composition up to £150. It was proposed that the composition should be paid by instalments spread over twelve months. A resolution was carried in favour of the acceptance of the composition, it being also resolved to confirm the deed of assignment already executed, and a committee of inspection was nominated. The following are creditors:—

	£		£
Associated Service Co. ...	50	Marconiphone Co., Ltd.	350
Bankers	196	Wholesale Fittings Co.	189
Biederman, L.	33		

Dissolutions of Partnership.

E. C. JENKINS (firm), radio and electrical engineers, 124, Cheltenham Road, Bristol.—Mr. E. C. Jenkins and Mr. C. O. Mayer have dissolved partnership. Mr. Jenkins will attend to debts and continue the business under the same style.

SHEPPARD, JARVIS & EVERED, electrical and mechanical engineers, Victoria Gate, Taunton.—Mr. E. Sheppard, Mr. W. J. Jarvis, and Mr. F. L. Evered, have dissolved partnership. Messrs. Jarvis & Evered will continue the business under the style of Jarvis & Evered.

THE ELECTRICAL MAINTENANCE CO., electrical contractors, 16-18, Braid Street, and 80, Crossburn Street, Glasgow, has been dissolved by mutual consent by the retiral of Mrs. Teresa Sinclair, or Harvey. Mr. W. S. Herd will continue the business on his account and under the same style.

Carnival Awards.

Messrs. Frank Taylor & Son, electrical engineers, of Milnsbridge, were awarded the second prize for their exhibit in the recent Milnsbridge charity carnival procession.

The Bingley Urban District Council Electricity Department was awarded the third prize, last week, for its tableaux in the annual charity gala procession, at Wilsden, a district supplied with electricity by Bingley.

Greek Electrical Workers' Strike.

The men employed on the State and other railways, including the electricity and gas workers, at meetings held last week, decided to go out on strike without warning.—*Reuter* (Athens).

Trade Announcements.

The WET H.T. BATTERY CO. states that its address from July 10th will be: 184-6-8, Shaftesbury Avenue, W.C.1. It has also been decided to alter the name of the company to "The Standard Wet Battery Co."

Mr. CHARLES JACKSON, electrician, of Whitby, has removed his business from Hunter Street, to 12, Silver Street.

Messrs. SHILVOCK & SON, electrical engineers and contractors, of Rugby, have removed their business from Regent Street to 197, Railway Terrace.

Messrs. HOLDER HARRIDEN, LTD., have removed from Chiswell Street to 6, Finsbury Square, E.C. Telephone number unaltered: "Clerkenwell 4138."

New Catalogues and Lists.

ABBEY CABLES, LTD., 47, Victoria Street, S.W.1.—A net trade price list of v.i.r. and lead-covered cables and t.r.s. cables and flexibles.

THE T.B.T. ELECTRIC CO., LTD., 171, Queen Victoria Street, E.C.4.—A stock list of d.c. and a.c. motors from ½ to 100 h.p. Priced.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—List No. 202, a priced catalogue of two- and three-phase motors of sizes over 75 h.p.

ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10.—A leaflet bearing testimonials from users of the company's current limiters.

MESSRS. LACY-HULBERT & CO., LTD., Boreas Works, Beddington, Croydon.—List C.1, bearing an illustration and particulars of an automatic electrically-driven air compressor. Priced.

BRITISH INSULATED CABLES, LTD., Prescot, Lancashire.—Publication No. P.235, in which are given fully-illustrated details of various types and sizes of spot welders made by the company.

THE UNITED KINGDOM RETAIL SHOPKEEPERS' ASSOCIATION, 115, Camberwell Road, S.E.5.—A leaflet advertising a tool for boring square holes and other tools and appliances.

HOUGHTON-BUTCHER (GREAT BRITAIN), LTD., 88-89, High Holborn, W.C.1.—"Houghton's Radio News," containing illustrated notes on radio sets and apparatus.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Book 2, Section Ia, illustrating and describing telephones of many patterns for offices, institutes and industries, including mining types. Priced.

PETTERS, LTD., Westland Works, Yeovil.—"Petter's Monthly News," containing illustrated articles and notes on "Petter" engines in all parts of the world.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Illustrated descriptive lists dealing with the company's truck-type switchgear, ironclad draw-out switchgear, ironclad switch-fuses, voltage and current transformers, motor-control panels, and other equipment.

MESSRS. FERGUSON, PAILIN, LTD., Higher Openshaw, Manchester.—A series of illustrated descriptive leaflets dealing with the company's isolating switches, potential indicators, truck switchgear, ammeter switches, &c.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38 & 39, Upper Thames Street, E.C.4.—Catalogue Z122, containing illustrated details and prices of "Siemens" ironclad switch- and fuse-gear, knife switches and teak-cased fuseboards.

A.F.A. ACCUMULATORS, LTD., 120, Tottenham Court Road, W.1.—An illustrated catalogue of "Pertrix" dry batteries for radio work, torches, &c. A separate price sheet is enclosed.

X-RAYS, LTD., 47, Red Lion Street, W.C.—An illustrated folder dealing with the new "X-L" cassette. Priced.

MESSRS. WARREN BROS. (MIDDLESBROUGH), LTD., 91 & 93, Grange Road, Middlesbrough.—An illustrated pamphlet and a calendar-blotter advertising the company's steam separator.

THE WATLIFF CO., 87, Cambridge Road, Kilburn, N.W.6.—A trade price list of standard automobile commutators.

Messrs. G. & J. WEIR, LTD., Cathcart, Glasgow.—A descriptive pamphlet upon the company's "Optimum" de-aerator.

SWITCHGEAR & COWANS, LTD., Old Trafford Park, Manchester.—Descriptive Section No. 1-3, dealing with single and three-phase, oil-immersed, remote-controlled, electrically-operated circuit-breakers.

July calendar blotters have been received from the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1, POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2, and Messrs. J. G. STATTER & CO., Queen Anne's Chambers, S.W.1.

THE ELECTRIC HEATING CO., George Street, Croydon.—A pamphlet containing illustrated particulars and prices of "Elect" immersion heaters.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—Leaflet 252, giving particulars, dimensions, and weights of the company's "Junior" solenoid panels for printing-press control.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1.—A pamphlet announcing reduced prices of "Henley" tape.

Book Notices.

Messrs. Gillett & Johnston, Croydon, have sent us a copy of an interesting illustrated tri-lingual (English, French and Flemish) brochure produced for the occasion of the dedication of the memorial library, carillon and clock of Louvain, on July 4th. The carillon was presented by American engineers in memory of their colleagues who fell in the great war and the work was executed by Messrs. Gillett & Johnston.

"Evershed's Broadsheet," No. 1, July, 1928. (8 pp., ill.). Evershed & Vignoles, Ltd. Price 1d.—This is the first appearance of a little magazine devoted to the social affairs of the company's employés and to other matters of interest to them.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVII. June, 1928. No. 6. New York: The Institute. Price $1.

"Science Abstracts." A. & B. Vol. XXXI. June 25th, 1928. Part 6. London: E. & F. N. Spon, Ltd. Price, 3s. each.

Technologic Papers of the U.S.A. Bureau of Standards. No. 367, "Effect of the Testing Method on the Determination of Corrosion Resistance." Price 20 cents.

Social Events.

The Johnson & Phillips Athletic Club sports were held at the sports grounds, Kidbrooke, on June 23rd. The weather was ideal, and there was a very large gathering of members and friends. The programme of contests followed the usual lines, and the fine array of prizes, the gift of the directors and management, provoked some keen struggles. The directors present were Mr. J. Macgregor (chairman and managing director), Mr. H. J. Sheppard, and Sir Philip Dawson, M.P. The prizes were presented by Lady Dawson, who was thanked by Mr. W. Burge, chairman of the club. Music was provided by Callender's Cable Works Band.

The opening of the sports ground of the Pirelli-General Cable Works Social and Sports Club took place on June 23rd. The ground, consisting of approximately 23 acres of land, has been laid out under the supervision of Mr. A. C. Woodley, and provides four grass tennis courts, four hard courts, three football pitches, a hockey ground, a cricket ground and bowling green, a nine-hole golf course and children's playground. A pavilion with accommodation for dancing and social events is also available, besides dressing rooms and parking space for cars. Owing to illness, Mr. G. A. Pirelli was unable to be present, and the opening ceremony was performed by Mr. G. Martinez, director and general manager, Mr. A. E. Greenhill officiating as chairman. Mr. G. Martinez said that the company had not hesitated to spend a good deal of money, firmly believing that it was for the good of all of them. He paid a tribute to Mr. Woodley, the secretary, who had spared no effort. After the ceremony, various competitions commenced, including a cricket match between Eastleigh and Southampton Works, which resulted in a win for the Southampton team by 88 runs to 65, children's races, an open-air whist drive, a golf stroke competition, a target bowls competition, a mixed doubles tennis tournament, obstacle races, &c. Later in the evening prizes were presented in the pavilion to the winners by Mr. Martinez. The Club Orchestra played selections during the afternoon and at night provided an excellent programme for dancing in the pavilion.

The final tie in connection with the "Hugo Hirst" Challenge Cup, offered for competition between the London establishments of the General Electric Co., Ltd., was played at Wembley on June 23rd, and resulted in a win for the Magnet House team, who were successful in beating the Osram Glass Works. This is the first time the cup has been won by Magnet House for many years.

The annual outing of the employés of the Saxonia Electrical Wire Co., Ltd., took place on June 23rd, when two charabancs conveyed a party of 54 to Bognor. Favoured by glorious weather, the journey was most enjoyable. Luncheon was served at the Central Restaurant, the chair being taken by Mr. L. H. Euler, supported by Mr. R. Bruce. After lunch various parties went swimming, golfing, &c., until the evening.

The F.B.I. and the Tax on Imported Oils.

The Federation of British Industries recently sent a deputation to the Chancellor of the Exchequer to discuss the effect of the duty upon imported hydro-carbon oils upon industry. Mr. H. D. Symonds (who with Mr. A. B. Carr represented the British Electrical and Allied Manufacturers' Association), speaking on behalf of the manufacturers of insulating materials, stated that this was a key industry established since the war which was facing severe competition. It would therefore not be possible to pass on the tax to the consumer. The tax, moreover, came at a time when the industry, which depended very largely upon research, was faced with the termination of the grant hitherto received from the Department of Scientific and Industrial Research. The tax would amount to between three and four times the saving effected by the proposed reduction of rates. Mr. Churchill, having heard other members of the deputation, said that he could not hold out any hope of exemptions such as had been asked for. The old petrol tax had proved most inefficient because of the complications, and he could not run the risk of compromising the simplicity and integrity of the new tax. If there were industries which would lose more in this way than they would gain by rating relief they were very small exceptions to the general trade of the country.

New French Company.

A company has recently been formed in Paris (54, Boulevard Haussmann), with a capital of 1,200,000 fr., and the title La Société Union Rurale d'Electricité, to establish distribution systems in rural districts of France not yet furnished with electricity supply.

Unemployment.

There was an increase of 12,560 in the number of registered unemployed during the week ended June 18th. The total at that date was 1,162,500, as compared with 1,149,940 on June 11th, and 987,348 on June 20th, 1927.

Polish Telegraph Development.

It is reported that the Polish Government is in negotiation with the International Telegraph and Telephone Corporation with regard to a credit of 300,000,000 zloty for the development of the telephone and telegraph system in Poland. The loan is intended to be chiefly applied to the substitution of underground cables for the present overhead network.

The Sheffield Lighting Conference.

The following companies are assisting at the forthcoming conference of the Association of Public Lighting Engineers at Sheffield :—The Electric Street Lighting Apparatus Co., Foster and Pullen, Ltd., Revo Electric Co., Ltd., Korting & Mathiesen Electrical, Ltd., General Electric Co., Ltd., Metro-Vick Supplies, Ltd., Bland Light Syndicate, Ltd., Engineering and Lighting Equipment Co., Ltd., W. Sugg & Co., Ltd., Holophane, Ltd., Lighting Trades, Ltd., W. Parkinson & Co., Wardle Engineering Co., Ltd., Benjamin Electric, Ltd., and Lewenz & Wilkinson, Ltd.

New F.B.I. Headquarters.

The Federation of British Industries has acquired a site in Tothill Street, S.W.1, upon which new offices are to be erected.

Australian Deferred Duties.

The "deferred" duties upon several classes of goods entering Australia which were to come into force on July 1st, have been further postponed. In the case of "electric household dish-washing machines," the new date is October 1st, 1928, and in the case of valves for wireless telegraphy and telephony the duties are postponed until July 1st, 1929.

Stepney and the General Strike.

At last week's meeting of the Stepney Borough Council a report was submitted of the High Court proceedings in which certain members of the Council were ordered to pay damages to a local firm in consequence of their decision (as members of the Electricity Committee) to cut off the supply of electricity to the firm's works during the general strike of 1926. It was recommended that the Council should pay the expenses incurred by those members although it was realised that the Council had no power to pay the damages. The matter was referred back for further consideration.

Swedish Electrical Exports.

During the first four months of the current year Sweden exported electrical machinery valued at 13,351,000 kr. (£734,000), as compared with 10,390,000 kr. (£570,000) in the corresponding period of 1927. The value of telephone and telegraph apparatus exported during the same period was 3,636,000 kr. (£200,000), against 2,630,000 kr. (£141,000).

For Sale.

The West Central Merchandise Mart will sell by auction, on July 12th, at 11, Red Lion Passage, Holborn, W.C., 10,000 coils of v.i.r. lighting cables. (See our advertisement pages to-day.)

Prices of Raw Materials.

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, July 3rd: No change in copper and lead prices.

Messrs. Edward Till & Co. report, July 3rd: India-rubber Para fine, 11¼d., ¼d. inc.

Lighting and Power Notes.

Ampthill.—STREET LIGHTING.—The Urban District Council has decided to accept the offer of the Bedford Corporation for public lighting by electricity with a guaranteed payment of £165 per annum. Hitherto gas has been used.

Blackburn.—ELECTRICITY SUPPLY.—The Rural District Council has rejected the proposal of the Lancashire Electric Power Co. to supply electricity to Pleasington, and has decided to support Blackburn Corporation's application for the necessary powers.

Bolton.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. H. E. Annett) for the year ended March 31st last show a total income of £359,094, as compared with £380,176 in the previous year. Working expenses amounted to £178,636, as against £233,981, leaving a gross profit of £180,458 (£146,195). After payment of capital and other charges there was a balance of £37,459, from which contributions to capital totalling £18,322 were made, leaving a sum of £19,137, which, with £21,682 brought forward from the previous year, made the total balance to be carried forward £40,819. The capital expenditure during the year amounted to £75,516, the chief items being £32,048 for machinery and plant at Back-o'-th'-Bank works, and £21,184 for mains. The sales of electricity increased from 57,212,160 to 64,466,454 kWh, and the maximum supply demanded from 26,880 to 29,000 kW. The average price obtained per kWh fell from 1.36d. to 1.13d.

Bromley (Kent).—ELECTRICITY CHARGES.—The Town Council has adopted an all-in tariff as an alternative to the flat rate as under:—Domestic purposes (private residences), 12½ per cent. of the ratable value, plus 1½d. per kWh. Business and non-domestic premises (excluding factories and similar premises), £12 10s. per kWh per annum, plus 1½d. per kWh.

Burnley.—YEAR'S WORKING.—We have received from Mr. J. E. Starkie, borough electrical engineer, a copy of his report, together with the statement of accounts on the working of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £102,319, as compared with £91,962 in the preceding year, and working expenses were £58,554, as against £72,527, leaving a gross profit of £43,765 (£19,435), to which was added an unemployment grant of £748, making a total of £44,513 available. After payment of capital charges there was a net surplus of £24,990, as compared with a deficit of £6,062 in 1926-27. The capital expenditure during the year amounted to £36,088, the chief item being £14,898 for l.p. mains and services. The electrical energy sold increased from 10,592,835 to 12,164 965 kWh, and the maximum supply demanded from 4,880 to 5,340 kW.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Winnipeg correspondent of the *Financial Times* reports that the development of the Island Falls power site, Churchill River, 60 miles north-west of the Flin-Flon mine, Northern Manitoba, will commence as soon as the railway is completed to the mine. The initial development will be 36,000 h.p., with a potential capacity sufficient to supply the needs of Northern mining development, including the Sherritt-Gordon. The cost is estimated at $7,000,000. Saskatchewan's Premier states that one-sixth of the power developed at the Island Falls must be available for the general needs of the province if required. The plant will be the farthest north hydro development of the Dominion and in a hitherto almost unexplored section.

Continental.—GERMANY.—Negotiations are stated to be proceeding between the Berlin Municipal Electricity Works Co. and the Siemens-Schuckert group with regard to the construction on the Lower Spree of a station similar to the large Rummelsburg works. The expenditure on the latter was 70,000,000 marks. The new station is to have an installed capacity of 200,000 kW.

Dover.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking record a net surplus of £8,960 for the year ended March 31st last, which, with a balance brought forward from the previous year of £1,964, makes a total of £10,924. This has been disposed of as follows:—Depreciation of investments, £3,000; contribution to capital, £5,000; balance, carried forward, £2,924.

Dumfries.—ELECTRICITY SUPPLY.—The County Council is to make application to the Electricity Commissioners for a special Order, and has decided that representations shall be made to the Commissioners and the Central Electricity Board urging that a scheme for an area embracing the county of Dumfries (and, if desired by these County Councils, the Counties of Wigtown and Kirkcudbright) be prepared and adopted, and that such main transmission line or lines be constructed as will enable a supply of electricity to be distributed within the area as soon as practicable.

East Lothian.—ELECTRICITY SUPPLY.—Good progress is being made with the electricity scheme. Cables have now been laid from North Berwick sub-station to East Linton by the Lothians Electric Power Co., and the supply of electricity will be available within a few months. It is expected that the circuit will be completed *via* Tranent, Haddington, Traprain Law, East Linton, and North Berwick, and provide a duplicate supply.

Guildford.—ELECTRICITY EXTENSION.—At a recent meeting of the Corporation Electricity Committee, the borough electrical engineer reported that he had gone further into the question of extending the mains to Onslow Village, and that the total cost would be £3,307. There were already 66 consumers in that locality, and there were 53 residents who were waiting for the supply. He estimated that in a year's time the Corporation might expect a revenue of £800 from the consumers connected at Onslow Village. It was decided to extend the mains accordingly.

ELECTRICITY IN BULK.—The Electricity Commissioners have given sanction to the Corporation Electricity Committee to supply bulk electricity to the Cranleigh Gas & Electricity Co.

LOANS.—The Committee is seeking sanction to the borrowing of £20,000 for mains and £1,000 for street lamps.

Hornsey.—NEW PLANT.—The borough electrical engineer has reported that it is advisable to make application for sanction to extensions to the generating plant, to include a 5,000-kW Ljungström set, together with the necessary steam and water piping, and also an additional cooling tower with water piping, foundations, &c.

Isle of Thanet.—REVISION OF CHARGES.—The Isle of Thanet Electric Supply Co., Ltd., has introduced the following revised rates for Margate, Broadstairs, Westgate, and Birchington:—Margate and Broadstairs: Lighting for all general consumers, subject to a rebate of 10 per cent. for the quarter in which the account amounts to £15 or over, 8d. per kWh; for large consumers, varying from 7d. per kWh for over 5,000 kWh per annum and under 10,000 kWh, to 5d. for over 30,000 kWh, less 5 per cent. for prompt payment of accounts. Westgate and Birchington: An addition of 1d. per kWh in each case. Combined district: Power, 3½d. per kWh; heating, 2½d. per kWh for the first 100 kWh per quarter, 2d. for the next 100 kWh, and 1½d. per kWh beyond.

London.—HAMMERSMITH.—The Borough Council Finance Committee has recommended that application be made for sanction to loans of £28,527 for mains, meters, switchgear, transformers, &c., during the current year, and £7,433 to cover excess expenditure on similar items during the past year.

Luton.—OVERHEAD LINES.—The Minister of Transport has consented to the Town Council erecting 6,000-V overhead lines between Linslade and Liscombe.

NEW PLANT.—The formal consent of the Electricity Commissioners to the extension of the generating station by the installation of a 12,500-kW set, two boilers, and additional buildings, has been received.

Oldham.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. F. L. Ogden) on the working of the electricity undertaking for the year ended March 25th last shows a total revenue of £245,569, and working expenditure of £130,881, leaving a gross profit of £114,688. The figures for the preceding year were: Income, £298 407; working expenses, £214,095, gross profit, £84,313. To the gross profit was added revenue from other sources, making a total of £141,121 available, and, after meeting capital and other charges, there was a net surplus of £29,570, as compared with £14,116 in 1926-27. The capital expenditure during the year amounted to £247,331, and included £215,716 for plant, buildings, &c., for the new station at Chadderton, and £22 466 for mains. The total now spent on the undertaking stands at £1,452,802. The electrical energy sold increased from 45,866,642 to 47,480,355 kWh. Good progress was made with the erection of the Chadderton station, and the building was sufficiently advanced to enable the various contractors for boilers, switchgear, travelling crane and turbo-alternators to proceed with the erection of their various plant. The foundations for the cooling towers and the laying of the track for the private railway sidings was proceeding.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

FAVERSHAM.—Lighting: From 8½d. to 8d. per kWh. Power: A reduction of ½d. per kWh to consumers of over 5,000 kWh per annum.

HAMMERSMITH.—Lighting: Ordinary meters, from 4½d. to 4d. per kWh; prepayment meters, from 5d. to 4½d. per kWh. General power, and combined power and lighting supplies, with minimum annual consumption of 28,000 kWh for five years from 1.4d. to 1.25d. per kWh.

HAMILTON.—In connection with the scale of reduced charges published in the ELECTRICAL REVIEW for June 29th, p. 1136, Mr. W. J. Cooper, burgh electrical engineer, informs us that the following power rate is in operation:—First 2,000 kWh per quarter, 2½d. per kWh; next 5,000 kWh, 1½d.; next 10,000 kWh, 1½d.; next 40,000 kWh, 1½d.; next 40,000 kWh, 1d.; all energy in excess of 97,000 kWh, ¾d. per kWh.

SHIPLEY.—Lighting—Flat rate from 6½d. to 6d. per kWh. Power and heating—From 2½d. to 2d. per kWh. Alternative ratable value scale for houses and shops—From 1d. to ¾d. per kWh. Minimum charge for new services from £2 to £1. Large power users—A general reduction of 10 per cent., and the abolition of meter rentals. A new alternative charge of 5d. per kWh has been introduced for churches, kinemas, hospitals, &c.

MERTHYR TYDFIL.—*Merthyr Electric Traction & Lighting Co., Ltd.*—Power: First 500 kWh per quarter, 4d. per kWh; next 500 kWh, 3d.; next 1,000 kWh, 2d.; all over 2,000 kWh, 1½d. per kWh.

KINGSTON-ON-THAMES.—Lighting: Varying from 5d. per kWh for the first 8,000 kWh, to 2½d. per kWh for all energy in excess of 48,000 kWh; prepayment meters, from 7d. to 6½d. per kWh. Power: First 6,000 kWh, 2½d. per kWh; next 10,000 kWh, 1½d.; beyond, 1d. per kWh. Heating and cooking: Flat rate from 1d. to ¾d. per kWh.

Ramsbottom.—STREET LIGHTING.—The Lighting Committee has accepted the tender of the Lancashire Electric Power Co. for the conversion of street lighting from gas to electricity.

Shipley.—LOAN SANCTIONED.—The Urban District Council Electricity Committee has obtained sanction to the borrowing of £4,532 for the installation of a 1,000-kW rotary convertor.

BULK SUPPLY.—June 30th was the first anniversary of the inauguration of the 33,000-volt supply of electricity from the system of the Yorkshire Electric Power Company, in place of that formerly generated at the Council's electricity works. A debit balance at the beginning of the year of £5,439 resulting from the coal dispute was converted into a profit of £10,068, with the result that from July 1st the long-promised reduction in the price of electricity will be an accomplished fact.

Skegness.—ELECTRICITY SUPPLY.—The Urban District Council has decided, subject to powers being obtained from the Commissioners, to obtain a supply of electricity from the Boston and District Electric Supply Co., Ltd. It is proposed to convey the supply from Boston by overhead cables, and to charge 8d. per kWh for lighting and 3d. per kWh for power. The Council will receive special terms for lighting and power required for the orchestral Piazza and other foreshore attractions. Pending the grant of an Order, the company will put down at its own expense temporary plant for a supply of electricity for the attractions named. The Council is to have the option of purchasing the undertaking at the end of 21 years.

South Africa.—JOHANNESBURG.—At a special meeting, the Corporation Tramways and Lighting Committee agreed to recommend a further expenditure of £12,500 towards the completion of the new power station.

Southampton.—ELECTRICITY IN BULK.—The Electricity Commissioners have approved an agreement between the Town Council and the West Hants Electricity Co. for a bulk supply of electricity. Terms have been quoted to Winchester City Council for a bulk supply to the city's main sub-station for supplying electricity to the parishes of Twyford and Compton. The additional estimated cost of giving the supply from Eastleigh sub-station will be £5,387.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the Power Development Co., Ltd., authorising it to supply electricity in parts of the rural districts of Cheadle and Stone; the Boston and District Electric Supply Co., Ltd., to supply electricity in the urban district of Skegness, and part of the rural district of Spilsby; the Yorkshire Electric Power Co., to supply in part of the rural district of Chapel-en-le-Frith; and the Brentwood District Electric Co., Ltd., to supply in parts of the rural districts of Romford and Billericay.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Preston Corporation to supply electricity in the urban district of Kirkham, and parts of the rural districts of Fylde and Garstang, and the Urban District Council of Felixstowe to supply in the rural district of Woodbridge.

Stoke-on-Trent. — YEAR'S WORKING. — We have received from Mr. C. H. Yeaman, city electrical engineer, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total revenue amounted to £198,944, as compared with £176,591 in the preceding year. Working expenses decreased from £99,821 to £85,107, leaving a gross profit of £113,837, as against £76,770, to which was added revenue from other sources, making a total of £115.141. Capital charges absorbed £84,637, and there was a net surplus of £30,504, as compared with a deficit of £4,944 in 1926-27. The expenditure on capital account during the year amounted to £218,528, the chief items being £109.210 for plant and machinery, and £63,980 for mains and services. The sales of electrical energy increased from 17,458,781 to 23,085,577 kWh, and the maximum supply demanded from 9,056 to 10,908 kW. The average price obtained per kWh fell from 2.37d. to 2.11d.

Stourbridge. — INSTITUTION SUPPLY.—The Board of Guardians has decided to install an electric lighting system in the Poor Law Institution, at a cost of £1,500.

Ushaw Moor (Durham).—ELECTRICITY SUPPLY.—The Durham Rural District Council has accepted the tender of the County of Durham Electrical Power Distribution Co., Ltd., for supplying electricity to Ushaw Moor. The company will erect a sub-station, install distribution mains and meters, and supply electricity through ordinary meters at 6½d. per kWh, and through slot meters at 7d. per kWh. The Council is to pay £763 towards the cost of transmitting electricity to the site and distributing it.

West Ham.—ELECTRICITY EXTENSIONS.—The Town Council has received formal consent to the extension of the generating station, including one two-phase, 50-cycle turbo-alternator having a maximum continuous rating of 30,000 kW, and two boilers.

Wimbledon.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to the following loans: Sub-station land, £250; sub-station buildings, £1,080; and sub-station equipment and kiosks, £15,587.

Tramway and Railway Notes.

Australia.—MELBOURNE.—The *Electrical Engineer of Australia and New Zealand* reports that at a recent luncheon of the Melbourne division of the Institution of Engineers, Australia, Mr. C. G. H. McDonald, Assistant Chief Electrical Engineer of the Victorian railways, gave some interesting information regarding the electrified Melbourne suburban railway system. The whole of the lines in the metropolitan area, comprising 163 route miles, are electrified, and the capital expenditure to date on the system is £6,600,000. There are 385 motor coaches and 476 trailers, and at the peak period 103 trains are in service. The total car mileage per annum is 39,000,000, and the average per car per annum is 46,000. The number of passengers carried per annum is 160,000,000. The Flinders Street station handles 241,000 people per day, having the heaviest traffic of any surface line station in the world. Energy for the system is generated at the Newport power station, which has 24 boilers with an aggregate capacity of 900,000 lb. of steam per hour, and six turbo-alternators with an aggregate capacity of 78,000 kW. The maximum load that the station has carried is 67,200 kW, and during the year 1923-24 the output was 264,000,000 kWh. This was the heaviest output that has been experienced, for during this year 116,000,000 kWh was sold as bulk supplies to distributing authorities and industrial works. Most of the bulk supply now has been taken over by the Electricity Commission. The energy is distributed through 20 traction sub-stations, of which seven are automatic. The Jolimont sub-station has four 4,500-kW rotary convertors, which are among the largest convertors in the world used for traction purposes. Energy is conveyed from the power station to the sub-stations by means of 20,000-V three-phase underground cables and overhead lines. The total mileage of cables is 155 and of overhead lines 120. The electricity is conveyed to the trains at 1,500 V by a system of 404 miles of overhead wires.

Continental.—FRANCE.—M. Andre Tardieu, Minister of Public Works, has completed the technical and financial conditions that will enable the Midi Railway Co. to continue its electrification work, partly with German assistance on reparation account. The new series of works includes the electrification of 1,100 km. of line, thus increasing to 1,950 km. the length of electrified Midi lines, or nearly half the entire length of the company's system. The execution of the works will be spread over a period of five years. The cost is estimated at about 500,000,000 fr., from which French industry will benefit to the extent of 310,000,000, while Germany (by contributions in kind) will provide plant to the value of 190,000,000 fr. The French share includes installation work and cost of labour. Taking into account the cost of providing continuous brakes for the French goods trains, the new agreement for the electrification of the Midi lines will raise to 1,240,000,000 fr., the amount of work to be carried out by French industry during the next five years; at the same time an amount of nearly 900,000,000 fr. will be recovered from Germany.

The Prefect of the Seine has laid a memorial before the Paris Town Council and the Seine General Council relating to a proposed extension of the Paris underground railways to the suburbs. He asks for authority to take the necessary steps to have the extensions of the following lines declared of public utility:—Line No. 1, from the Porte de Vincennes to the Fort of Vincennes; Line No. 9, from the Porte de Saint-Cloud to the Pont de Saint-Cloud; Line No. 3, from the Porte de Champerret to the Pont de Levallois; Line A of the Nord-Sud, from the Porte de Versailles to the Mairie of Issy-les-Moulineaux. The Prefect also asks for authority by the two Councils to enter into negotiations with the managements of the underground system with the view of fixing the régime of the future exploitation. The cost of construction is estimated at 232,600,000 fr. for the Department of the Seine and 17,500,000 fr. for the Town of Paris.—*Reuter's Trade Service* (Paris).

The Ministry of Public Works announces that part of the money owed by Germany is to be set aside for the increase of electrification in France. The new works comprise the electrification of no less than 1,400 kilometres of railway, so that the length of railways electrified in the South of France will attain to a total of 1,950 kilometres.

NORWAY.—The Oslo correspondent of *The Times* reports that King Haakon, in the presence of a number of authorities, on June 27th officially opened the first underground railway in Norway, running from Majorstuen to the National Theatre. From Majorstuen the railway, which is similar to an electrical tramcar line, proceeds by open air to the well-known tourist places, Holmenkollen and Frogner-Saeteren. The underground part of the railway is about 2 km. in length. Work on this portion of the railway occupied a number of years, and the total cost was 1,000,000 kroner.

SWITZERLAND.—A proposal has been made to extend the Visp-Zermatt railway from Visp to Brig, at a cost of £34,000, so as to link it with the Brig-Furka-Oberalp line, purchased last year by the Visp-Zermatt Company, and to electrify the Visp-Zermatt line, at a cost of £66,000, including the purchase of five electric locomotives. In order to meet these expenses, the Visp-Zermatt Railway Company has decided to issue new shares to a total value of £100,000.

It is proposed to build a new electric power-house in the Canton of Argovie, which will benefit German railways; a concession was granted on June 4th of this year to the engineers Moor and Affeltranger, to build the station at Klingnau. The construction of these works will depend on permission being given by the Conseil Fédéral. The whole of the output of the works at Klingnau, estimated at 192,000,000 kWh per annum, is destined for the Rheinisch-Westfälischen-Elektricitätswerk, and will be employed by the latter for electric traction on German railways. The State Counsel of Argovie considers that half the shares in the company that is about to be floated should be held by the Canton itself. The Swiss Federal Railways show receipts for May this year of 1,247,000 francs more than in May, 1927. Part of this increase is due to the falling of Whitsuntide early. A slight falling-off in the traffic between France and Italy was more than compensated for by an increase between Italy and Germany, bringing profit to the C.F.F. Working costs have been reduced, thanks to the electrification; fewer men are required, and running expenses for the month of May show a reduction of 112,000 fr., as compared with those of the same month last year.

ITALY.—A correspondent states that a recent visit to Italy revealed the increasing importance attached by the Government to the electrification of the Italian State Railways. The run between Bologna and Florence is now a delight, instead of a foretaste of purgatory, as it used to be, because of the innumerable tunnels running through the Apennines, and it is with regret that one changes electric traction for that of steam, when one goes from Bologna to Venice.

Good progress is being made with the electrification of the Dolomite railway between Calalzo, Cortina d'Ampezzo and Dobbiaco, a distance of about 40 miles. The line will be operated at 3,000 V d.c.

London.—TRAMCAR COLLISION.—A collision occurred between two L.C.C. tramcars on June 27th in Lewisham High Road, New Cross. A tramcar on the up journey was pulling up at the " request " stop when another car bound for Victoria came down the curved incline and crashed into the rear of the first. The driver of the first car, who was flung from the controls, succeeded in regaining his position, and applied the brakes, bringing the interlocked cars to a standstill. The cars were well loaded with passengers, and 20 received slight injuries, while one passenger was conveyed to the Miller Hospital, where a leg was amputated.

Telegraph and Telephone Notes.

France.—TELEGRAPH AND TELEPHONE SERVICES.—A loan was issued on June 25th, the proceeds of which are to be used for bringing the telegraph and telephone services up to date. New long-distance telephone cables are to be laid down, the automatic telephone is to be installed in Paris and the big provincial towns, more rapid transmission by telegraph is to be provided, and automatic transmitters fitted, &c. Improvements are also planned for public wireless services, while a sum is to be set aside for larger and more convenient post offices. Five-hundred-franc bonds will be issued, which will be inscribed in a special column of the Public Debt; they will bear interest at 5 per cent., and will be redeemable in a maximum of thirty years at par, bonds being redeemed by drawings every six months and also by purchases on the Bourse. The bonds will be exempt from any special taxation. The issue price has not yet been announced.—*Reuter* (Paris).

INTERNATIONAL TELEGRAPH USERS COMMITTEE.—A new international body has recently been formed for the purpose of representing the users of the telegraph—the Committee on International Telegraphy of the International Chamber of Commerce, whose activities will be directed to the improvement of telegraph services generally. Inquiries will be undertaken periodically with this aim in view. The Committee has already held its first meeting at the Paris headquarters of the International Chamber of Commerce. Among the questions under discussion was that of the reduction of code words to five letters, which is to form the object of the Congress of the International Telegraph Union which meets in Brussels in September of this year. Demands have been made that if this system is adopted it should no longer be required that code words be pronounceable, and that rates should be reduced by 50 per cent., otherwise the reform would offer to the users but slight advantages over the present system. The Committee was unanimous that the proposed reform should not entail additional expense to the user. This recommendation will be embodied in the report which the International Chamber of Commerce proposes to lay before the forthcoming Congress at which it will probably represent telegraph users.—*Reuter* (Paris).

Hull. — YEAR'S WORKING. — The Corporation Telephones Committee has received from the manager of the undertaking (Mr. T. Holme) his report for the year ended March 31st last. The total revenue amounted to £117,225, working expenses were £78,042, leaving a gross profit of £39,183, and after payment of capital charges, and making a contribution to the relief of the rates there was a net surplus of £11,204. The royalty tax paid during the year amounted to £11,371, making a total from the commencement of the service of £140,970. During the year £29,781 was expended from the reserve fund for the provision of additional land, buildings, and equipment, making a total of £73,345 contributed from revenue and reserve for capital works. The report states that with normal development and the application of this policy to all types of plant, there should be no necessity to ask for any further borrowing powers, because as each of the existing loans is repaid the amounts now required for interest and loan charges will be available to meet part of the new capital expenditure and leave a margin for tariff reduction.

South America.—INTERNATIONAL TELEPHONE SERVICE.—An international telephone service between Chile, Argentina and Uruguay, which ultimately will be extended throughout South America, connecting with the United States and European countries, was inaugurated on June 22nd by the Presidents of the respective countries when they exchanged official greetings from the Presidential Palaces at Santiago, Buenos Aires, and Monte Video. The circuits connecting Monte Video and Santiago, through Buenos Aires, over 1,030 miles, were arranged by the International Telephone and Telegraph Corporation through joint co-operation with the Compania Teleponica of Argentina, the Chile Telephone Co. and the National Co-operative Telephone Co. of Monte Video, together with All-America Cables, Incorporated. Colonel W. F. Repp, vice-president of the I.T.T., directed the inauguration from Buenos Aires. After Presidents Ibanez. Alvear and Campistegny had exchanged official greetings, various Cabinet officials conversed, after which the line was opened for public service.

Irish Free State.—TELEGRAPH BILL.—In Dail Eireann, on June 27th, the final stage of the Telegraph Bill, under which the minimum charge for a telegram is increased from 1s. to 1s. 6d., was passed by 59 votes to 33. President Cosgrave said that this was one of the services which, by reason of the economic situation in the country, was rather more burdensome than it might otherwise be. He added that even this impost would not meet the entire demands of the service.

International Telephony.—RUSSO-GERMAN SERVICE.—Representatives of the Soviet Postal Administration have left for Reval to negotiate with the Estonian Ministry of Communications with a view to establishing a telephone service between Russia and Germany *via* Reval and Riga.

SERVICE TO THE SARRE.—The Postmaster-General announces that from June 28th telephone service was established between all parts of Great Britain and Saarbrücken and the other principal places in the Sarre Territory.

Sweden.—TELEPHONE AND TELEGRAPH SERVICES.—The annual report of Telegrafstyrelsen shows that Sweden's telephone system continues to make further steady progress. During 1927 the number of telephone subscribers in Sweden increased by 15,000 to 453.500. Telephone communication with foreign countries was extended in 1927 to Great Britain, France and Belgium, and foreign traffic increased considerably. The largest number of conversations was with Denmark (260,000). Inland telegrams during 1927 numbered 2,719,000, and foreign terminal telegrams 2,544 000. These figures represent a considerable increase in foreign telegrams and a slight decrease in inland telegrams. The income derived by Telegrafverket from telephones and telegraphs increased during 1927 by Kr.3,500,000 to Kr.86,500,000, while expenditure rose by Kr.2,400,000 to Kr.67,600,000. The net profit increased by Kr.1,100,000 to Kr.18,900,000, or 6¼ per cent. on the invested capital.—*Reuter's Trade Service* (Stockholm).

Radio Notes.

France.—EIFFEL TOWER STATION.—It is reported that the Eiffel Tower station is undergoing complete transformation. The power is to be increased to 100 kW, and the wave-length is to be reduced to 1,500 metres.

LYONS STATION.—According to the *Wireless Trader*, the company which manages the Radio-Lyon station is increasing the power of its transmissions to 25 kW. The new station will be situated about eight miles outside the city so that it will not interfere overmuch with its immediate neighbours. Accommodation for 100 performers is available in the studio, which will be in the centre of the city. It remains to be seen whether the necessary permit will be obtained.

GOVERNMENT BILL TO SECURE STATE CONTROL.—The Government, on June 29th, tabled a Bill regulating wireless transmission in France; it is hoped to secure its adoption before Parliament rises. The Bill asserts the principle of State control of transmitting stations, which may either be worked by the State itself, or be leased for a period not exceeding ten years. A special Broadcasting Department will be created and placed under the control of the Minister of the Interior; its function will be to co-ordinate broadcasting from the various stations with particular reference to the preparation of programmes. An important provision of the Bill imposes taxes to meet the expenditure of the new Broadcasting Department. It is proposed, first, to enforce a small annual tax on receiving sets, varying from 10 to 20 francs per annum; secondly, to put a 4 per cent. tax on the retail price of valves; thirdly, to put a tax of not less than 20 per cent. on the revenue of transmitting stations from advertisements; and, lastly, to demand a share of the profit of private stations.—*Reuter* (Paris).

Regional Broadcasting.—NEW STATION.—Messrs. Alaway and Partners have completed negotiations with the British Broadcasting Corporation for the sale to it of a piece of land on the Brookland Park Estate, between Potters Bar and Hatfield, for the erection of the new regional station.

Sweden.—LICENCES.—The number of wireless receiving licences issued in Sweden showed a further increase in May, the number on the last day of the month being 363,863, as compared with 360,059 at the end of April.—*Reuter's Trade Service* (Stockholm).

United States.—BROADCASTING.—It was announced on June 25th that the Transmitter Section of the National Electrical Manufacturers' Association Radio Division had recommended that radio broadcasting stations be classified as to power thus: 0.5 kW, 5 kW, 50 kW, 500 kW. Mr. L. B. F. Raycroft, vice-president of the N.E.M.A. and head of its radio division, states that this proposed rating means that, in the Association's opinion, the smallest power possible to give good service shall not be less than 0.5 kW, that stations designed for greater service shall then start in power at 5 kW, then 50, and then 500 kW. It is understood that the N.E.M.A. power recommendations advise the relative increase of power in all stations, whether small or large.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—July 19th. National Sanitation Works Department. 24 electric sewage pumping plants. (A.X. 6389.)*

Australia.—MELBOURNE.—August 14th. Postmaster-General's Department. Junction apparatus for manual exchanges. (B.X. 4486.)*

July 11th. Telephone cable. (B.X. 4543.)*

Electricity Commission of Victoria. August 6th. Neutral earthing compensator. (B.X. 4519.)*

August 20th. 66,000-V transformers and spares. (B.X. 4541.)*

September 10th. Synchronous condenser and accessory plant. (B.X. 4545.)*

October 31st. Water-tube boilers, with auxiliary and accessory equipment.

SYDNEY.—August 29th. N.S.W. Government Railways. Two 20,000-kW turbo-alternators and condenser plant for Ultimo power house.

September 12th. One 60-ton electric overhead travelling crane for Ultimo power station. Chief Electrical Engineer, 61, Hunter Street, Sydney.

Barnstaple.—July 13th. Corporation. One 100-kW Diesel oil engine with d.c. generator, one storage battery, 240 cells, l.p. switchgear, and about 14 miles l.p. cables. (June 22nd.)

Belfast.—July 16th. Electricity Committee. One transformer kiosk, with h.p. and l.p. switchgear. (See this issue.)

Clydebank.—Town Council. Electric lighting installations for 350 houses. Specifications from the Town Clerk.

Dundee.—July 26th. Corporation Cleansing Department. Complete refuse disposal plant, including machinery for separation, two three-cell destructor units, boiler, chimney stack, storage bunkers, receiving hoppers, conveyors, &c. Specification (two guineas) from Mr. W. H. Sagar, cleansing superintendent.

Ecuador. — GUAYAQUIL. — July 31st. Government of Ecuador. One 5-ton (metric) and one 10-ton (metric) electrically-operated portal cranes. (A.X. 6387.)*

Harrogate.—July 17th. Electricity Department. Two 50,000-lb. boilers with pipework and accessories. (June 29th.)

Irish Free State.—DUBLIN.—July 18th. Electricity Supply Board. Transformer stations, switchgear, and transformers. (June 22nd.)

Kilmarnock.—July 9th. Town Council. Electrical installations for 24 houses, Mr. Robert Armour, 38, Bank Street.

Llandilo.—July 14th. Urban District Council. One 75-kW crude oil engine electric generating set; one 10-ton oil-storage tank, with pump, &c.; one control panel, with cable, &c. (June 29th.)

Loughborough.—July 21st. Electricity Department. One rotary or motor-convertor, with a.c. switchgear. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—July 27th. South-East England electricity scheme. 33,000-V overhead transmission line between Brighton and Worthing. (June 29th.)

LONDON COUNTY COUNCIL.—July 9th. Soot extraction plant for the Greenwich power station. (June 15th.)

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY. —July 12th. Transmission lines from the Kingston-on-Thames B.C. generating station to the Hersham sub-station of the Walton-on-Thames U.D.C. (June 22nd.)

New Mill.—July 11th (extended from June 29th). Urban District Council. Extension of overhead electricity supply mains. (June 22nd.)

Newport (Isle of Wight).—July 16th. Education Committee. Electric light installation at the Secondary School. S. R. Cocks, county surveyor, St. Thomas Street, Ryde.

Newry.—July 21st. Urban District Council. Two 100-b.h.p. (approx.) and one 150-b.h.p. (approx.) heavy-oil engines, each direct coupled to a l.p. 3-phase alternator; l.p. switchboard; one 5-ton overhead travelling crane; underground and overhead distributing mains and services and street-lighting installation. (June 29th.)

New Zealand.—WELLINGTON.—August 14th. Public Works Department. 50-kV switchgear and steelwork for Arapuni electric power scheme. (B.X. 4477.)*

Plymouth.—July 10th. Education Authority. Electric lighting installations at various schools. Specifications from the Town Clerk's office.

Salford.—July 9th. Electricity Department. E.h.p. and l.p. paper-insulated lead-covered and armoured cables. Particulars from City Electrical Engineer, Frederick Road.

Shoeburyness. — July 16th. Electricity undertaking. Underground mains, switchgear, transformers, &c.

Silkstone.—July 17th. West Riding Education Committee. Electric lighting and electric bell installations at Silkstone new school. Specifications from Education Committee.

South Africa.—JOHANNESBURG.—July 26th. South African Railways and Harbours. Two 25-ton, six 10-ton, and two 2-ton electrically-driven overhead travelling cranes. (A.X. 6347.)*

August 2nd. Electrically driven concrete mixing plant, self-propelling gantry, &c. (A.X. 6441.)*

August 9th. Six electrically-driven overhead travelling cranes. (A.X. 6409.)* 50-kVA transformers and 2,100-V truck-type switchgear. (B.X. 4526.)*

CAPE TOWN.—July 25th. City Council. A.c. meters. (B.X. 4527.)*

UITENHAGE.—July 30th. Municipal Council. H.p. and l.p. switchgear, h.p. and l.p. cable, motors, fans, transformers, transformer kiosks, &c. (B.X. 4517.)*

BULAWAYO.—August 14th. Municipal Council. One water tube boiler with chain grate, one turbo-alternator, spray cooling equipment with circulating water piping, one 3-panel switchboard. (A.X. 6454.)*

Stirling.—July 13th. Town Council. Electrical installation for 36 houses. Specifications, &c. (deposit of £1) from Mr. Andrew H. Goudie, burgh engineer.

Stockton-on-Tees.—July 9th. Electricity Department. Paper-insulated cables. (June 29th.)

Tilbury.—July 16th. Urban District Council. Complete electric lighting, cooking, and heating installation for 315 houses on the new housing estate. (See this issue.)

Uruguay.—MONTEVIDEO.—August 10th. 20 equipments for transformer sub-stations, indoor type (6,600/220 V). (B.X. 4505.)*

Waterford.—August 3rd. Corporation. 10,000-V and 400-V 3-phase and 200-V d.c. switchgear. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bedford.—Electricity Committee. Accepted:—
Main switchgear (£630).—British Thomson-Houston Co., Ltd.
Pipework (£607).—Brightside Foundry & Engineering Co., Ltd.
Extension to coal conveyor.—W. J. Jenkins & Co., Ltd.

Birmingham.—Education Committee. Accepted:—
Electric lighting installations at schools:—Colmore Road (£493) and Tilton Road (£411), Baxter & Impey; Bell Heath Camp (£427) and Dolphin Lane (£294), Reynolds & Bradwell; Yardley Wood (£332), Ellis & Ward.

Bradford.—Electricity Committee. Accepted:—
Electric lighting installations at Corporation housing estates (£204).—Taylor & Ashworth.
Electricity Department. Accepted:—
Circulating water pipes for Valley Road generating station. Staveley Coal & Iron Co., Ltd.
Tramways Committee.
92 steel tires (£290).—John Brown & Co., Ltd.
Installation of new passenger lift and repairs and alterations to existing goods lift (£794) at the new headquarters tramway offices.—Keighley Electrical Engineering Co., Ltd.

Hornsey.—Electricity Committee. Recommended:—
Extension of contracts for one year for the supply of conduits.—Doulton & Co., Ltd., and Albion Clay Co., Ltd.

Halifax.—Markets and Parks Committee. Accepted:—
Electrical installation for the arcade and shops in Market Street and Woolshops.—J. Harrison & Co.

Ilford.—Town Council. Accepted:—
Cable (£543).—Metropolitan Cable & Construction Co., Ltd.

Johnstone (Renfrewshire).—Housing Committee. Accepted:—
Electrical installation work for houses and shops.—G. Thomson & Son.

London.—LONDON COUNTY COUNCIL.—Education Committee. Electrical work at Lena Gardens School, Hammersmith:—

ALPHA MANUFACTURING & ELECTRICAL CO., LTD. (Accepted.)	£369
H. J. Cash & Co., Ltd.	413
Burdette & Co., Ltd.	414
Tredegars (1923), Ltd.	514
The Fordham Electrical Engineering Co., Ltd. ...	602

The chief engineer's comparable estimate is £440.

SOUTHWARK.—Electricity Committee. Recommended:—
Repairs to cooling towers (£950).—Davenport Engineering Co., Ltd.

ADMIRALTY.—Contract and Purchase Department. Accepted:—
Electrically-driven pumps.—Stothert & Pitt, Ltd.

AIR MINISTRY.
Dry batteries.—Edison Swan Electric Co., Ltd.

Luton.—Town Council. Accepted:—
12,500-kW set (£37,200).—Brush Electrical Engineering Co., Ltd.
Boilers.—Clarke, Chapman & Co., Ltd.
130-kW three-wire rectifier equipment (£1,312).—Hewittic Electric Co., Ltd.

Preston.—Electricity Committee. Accepted:—
Generating plant for the Ribble Power Station (£46,000).—English Electric Co., Ltd.

Southam.—Rural Council. Accepted:—
Wiring houses for electric light (£7 5s. per house).—Midland Electric Co.

Stirling.—Town Council. Accepted:—
Electrical work in connection with the new police buildings.—Mr. Alex. Brewster.

Stoke-on-Trent.—Electricity Committee. Accepted:—
Wiring for trip circuits motors, &c., at the power station (£289).—Mr. E. Holloway.

Ware.—Urban Council. Accepted:—
Electric motor for the Stanstead sewage pumping station (£147).—North Metropolitan Electric Power Supply Co.

Forthcoming Events.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, July 7th. 4 p.m. Visit to the generating station of the South Wales Electrical Power Distribution Co. at Upper Boat.

Electrical Contractors' Association.—July 4th-6th. Cheltenham. Annual conference.

Physical Society.—Saturday, July 7th. Visit to Bristol.

Association of Public Lighting Engineers.—July 9th-12th. Sheffield. Annual meeting and conference.

Colliery and General Engineering Exhibition.—Manchester. July 10th-21st.

Institution of Electrical Engineers (South Midland Centre).—Tuesday, July 10th. Summer meeting. Visit to Bakewell, Haddon Hall, and Matlock.

Royal Agricultural Show.—Wednesday, July 11th. Nottingham. E.D.A. Conference: "Some Suggestions on How Electricity Can Help the Farmer." Mr. W. Riggs.

Batti-Wallahs' Society.—Wednesday, July 11th. 1 p.m. Hotel Cecil. Luncheon. Address by Sir Phillip A. M. Nash.

Institute of Physics.—Thursday, July 12th. Institution of Electrical Engineers, London, W.C. 8 p.m. "Physics in Photography." Mr. C. E. Kenneth Mees.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

NOSCO electric lamp.

VAN LEER electric signs (believed Dutch, name of British agent wanted).

LEO THE LION wireless valves.

TIGER electric lamps (importer or manufacturer wanted).

BARCO wash boiler.

Notes.

Further Grants to Research Associations.

On June 29th Lord Balfour, Lord President of the Council of the Department of Scientific and Industrial Research, received a deputation led by Sir James Hinchliffe, past chairman of the Research Association for the Woollen and Worsted Industries, who presented to him a memorial from 19 Industrial Research Associations pleading for the continuance of State aid by means of further grants from the Department of Scientific and Industrial Research. Lord Balfour announced that he was impressed by the way in which Research Associations had proved themselves of real utility to the industries they represented, and with the necessity of Research Associations expanding the scope of their work if the results of their investigations were to be fully applied in industry. Accordingly, the Government had decided to make a further offer of grants through the Department on a £ for £ basis in respect of subscription income in excess of certain minimum figures to be fixed in each case on the advice of the Advisory Council. Unless this minimum income was assured, no grant would be payable; above the approved figure, and up to a maximum which would also be fixed by the Department on the Advisory Council's advice, grants would be given for a further period of five years, renewable for another five years in suitable cases.

Appointments Vacant.

Two shift engineers (£490 to £560) for the Perak River Hydro Electric Power Co., Ltd. Wireless operators for Government of Hong Kong (£260). Graduate in engineering subjects for the Dursley (Glos.) Secondary School and Evening Institute. Generating engineer (£400) for the Halifax Corporation Electricity Department. (See our advertisement pages to-day.)

Imperial College of Science and Technology.

Employers requiring men who have received a thorough training in the principles of engineering and who have obtained the diploma of the City and Guilds (Engineering) College, are asked to make use of the services of the Appointments Board. Application should be made to the Secretary; no fees are charged. (See our advertisement pages to-day.)

The I.E.E. Regulations for the Electrical Equipment of Buildings.

Precautions to be observed in connection with radio apparatus have been embodied in alterations and additions to the Ninth Edition, approved by the Council on May 17th, 1928. The principal items are abstracted below:—

Radio Apparatus Connected to Public or Private Supply Mains.—Radio apparatus which is *not connected* to the supply mains does not form part of the electrical equipment of a building, and is therefore outside the scope of these Regulations, but it should be noted that when in these conditions such apparatus (including a crystal set) is used in a room in which there is an electrical installation, care should be taken while using headphones, or while handling any of the radio apparatus having an earth connection, not to touch any metal switch, portable metal lamp standard, electric heating or cooking appliance, or any other metallic part of the electrical installation, as in the event of a fault in the electrical installation such metal may accidentally have become alive.

Protection of Live Parts.—All parts (including the terminals and connections of batteries) which are alive or are intended to become alive from the supply mains shall be so guarded as to prevent accidental contact with such parts under normal conditions of use.

Construction of Cases.—Any containing case made of conducting material shall be earthed in accordance with Regulations 101 and 102, and shall be provided with a suitable terminal for that purpose.

Protection Against Excess Current.—The apparatus shall be adequately protected by fuses on both poles of the circuit supplying it.

External Cable Connections to Radio Apparatus.—Where the conductor of any cable connected to radio apparatus is in direct connection with the supply mains, such cable shall be of one of the types specified in Regulations 76 to 81, and shall be installed in accordance with Regulation 87.

Isolation from Supply Mains.—(*a*) There shall be no connection, except through a condenser, between any conductor directly connected to the supply mains and the earthing lead of the radio apparatus which is connected to the earth plate, waterpipe or other earthing system. (*b*) Where radio apparatus is connected to *direct-current* supply mains the aerial shall only be connected to the apparatus through a double-wound high-frequency coupling transformer adequately insulated for a test pressure of 600 volts, or through a condenser inserted in series with the aerial circuit and immediately adjacent to the aerial terminal. Where radio apparatus is connected to *alternating-current* supply mains without the use of a double-wound "mains" transformer, the aerial shall be connected as described above, but the condenser referred to shall have a capacity not greater than 0.001 microfarad. (*c*) Head telephones and loud-speakers shall be connected to the radio apparatus either through a double-wound transformer or, alternatively, through a circuit which includes a condenser in series with each of the outgoing conductors.

Condensers.—The condensers referred to above shall conform in all respects to British Standard Specification No. 271-1926.

"Mains" Transformers.—Every "mains" transformer shall have its core earthed, and shall be of the double-wound type with an earthed metallic screen, or insulation capable of withstanding a test pressure of 1,000 volts (alternating current).

Insulation Resistance.—The terminals at which connections are made to the radio apparatus and every battery connected to the radio apparatus shall have an insulation resistance from the "mains" input terminals of the apparatus of not less than 2 megohms when tested at a pressure of 500 volts.

Electric Pumps for Main Drainage.

The agenda which the L.C.C. had for consideration at its meeting on July 3rd contained a report by the Main Drainage Committee, in which the adoption of electric motors was recommended, to replace the beam pumping engines at Abbey Mills. The report states that the boiler plant is 35 years old, and needs replacement, which raises the larger issue of dealing most advantageously with the ever-increasing quantities of sewage. The Abbey Mills pumping station deals with an area of 34 square miles, and its present pumping capacity is 1,146 tons per minute. The Committee is advised that additional pumping plant is necessary, and considers that electric power offers many advantages. It is proposed to install four sets immediately, and when the scheme is completed the pumping capacity will be increased by about 60 per cent. The beam engines that are being replaced have been at work since 1869.

Whitworth Society.

The fifth summer meeting was held on Thursday, June 28th, during the snummer meeting of the Institution of Mechanical Engineers at Southampton. The dinner took place at the Dolphin Hotel, the chair being taken by the President, Mr. Thos. Sugden, who installed the new President, Mr. F. H. Livens, J.P., director of Messrs. Ruston & Hornsby, Ltd., Lincoln. An interesting discussion took place regarding "The Whitworth Book." The membership roll now comprises more than 500 names. Full particulars may be obtained from the Hon. Secretary, Whitworth Society, c/o Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.

E.A.W. Activities.

Dr. and Mrs. S. Z. de Ferranti have very kindly invited two parties of twenty-seven members of the Manchester branch of the Electrical Association for Women to visit their all-electric house at Deganwy, near Conway, in the near future.

On June 26th Mrs. J. Tyler, hon. secretary of the South Wales branch of the Electrical Association for Women, gave a cookery demonstration to the branch at the new premises of the South Wales Electric Power Distribution Co., Newport Road, Cardiff.

Bristol Golf Competition.

The competition of the Bristol Electric Club for the "Langdon" golf cup took place on June 22nd. The competition was against bogey, and with one exception "Colonel Bogey" was the winner against every card returned. The leading scores show that Mr. A. J. Skinner wins the "Langdon" cup, which he will hold for one year; he will also receive a replica of the cup.

Cable Steamer Sale.

After 28 years' service in all parts of the world, the Eastern Telegraph Company's submarine telegraph cable-laying steamship *John Pender* is to be sold.

Sydney Bribery Charges.

The Sydney correspondent of *The Times* reports that Mr. Bavin, Premier of New South Wales, referring on July 3rd to the recent Royal Commission which inquired into the allegations of "graft" in connection with Sydney City contracts, said that prosecutions would be begun in certain cases in which sufficient evidence existed.

Late Legal.

ENGLISH ELECTRIC CO., LTD., *v.* CROMPTON PARKINSON, LTD.—Mr. Justice Romer, in the Chancery Division, on Tuesday, had before him a motion by plaintiffs asking for an injunction restraining alleged infringement of the copyright in three photographs of an electrical transformer of the plaintiffs' manufacture, known as the "Standard Specification Core Type Transformer."

Mr. Kenneth Swann, for the plaintiffs, said they had had the photographs made of the transformer for the purpose of using them in their trade literature and advertisements.

Mr. Trevor Watson, for the defendants, said he had not put in any evidence, as he thought he should probably be able to settle the matter. It was only a question of getting the necessary authority, and he suggested a week's adjournment.

Mr. Swann said the plaintiffs alleged that the defendants had used the photograph for advertisements in the trade journals in such a way as to describe the transformer as their product.

His Lordship: You want to stop further advertisements?

Mr. Swann agreed.

Mr. Watson said he was perfectly willing to give an undertaking. He did not want this motion to be used to get further publicity for the plaintiffs.

Mr. Swann said a considerable amount of publicity had been given to the defendants, to the detriment of the plaintiffs. Already statements had been circulated in the trade giving a wrong impression that this machinery was the defendants' product and that these photographs were photographs of the defendants' machinery.

Mr. Watson said the defendants offered an undertaking on June 6th which gave the plaintiffs everything to which they were entitled. This motion, he said, had been brought on purely for publicity purposes. He asked for a week's adjournment, and he would give an undertakings in the terms of the notice of motion.

This was assented to.

The Australian Mission.

Sir Arthur Duckham, K.C.B., and Sir Hugo Hirst, Bt., two members of the mission which is to investigate development possibilities in Australia, were the guests of honour at a dinner given by the British Electrical and Allied Manufacturers' Association at the Connaught Rooms on Tuesday last. Col. R. K. Morcom, C.B.E. (chairman of the Council) was in the chair. After dinner and the loyal toast, Mr. L. S. Amery, Secretary of State for Dominion Affairs, proposed the toast "Imperial Development." He said that it was our task to build up a new world, and the most urgent problem was the economic one—to convert our potential resources into realities. As an example of what could be done by a free federation of States, he pointed to the United States, which had erected a fabric of wealth and economic power which was without parallel. By co-operation and concentration, 50 States had formed a unit with an output and consumption of power greater than that of all the rest of the world. They had a single tariff which sheltered their industries from unfair foreign competition and left them free to compete fairly with each other. The British Empire had as good resources and man-power, but we fell short in economic concentration and purpose. We were, however, beginning to "Think Imperially," and many useful conferences had taken, and were taking, place. One of the most important recent developments was the appointment of a Development of Immigration Committee by Mr. Bruce. The British mission would meet that committee and receive first-hand information. The two members of the mission present were noteworthy industrial leaders, Sir Arthur Duckham, of the gas industry, and Sir Hugo Hirst, of the electrical industry. By vision, controlled by judgment, Sir Hugo had built up one of the greatest industries in the world. He had always regarded his work as an aspect of public service, and had done valuable work for the nation.

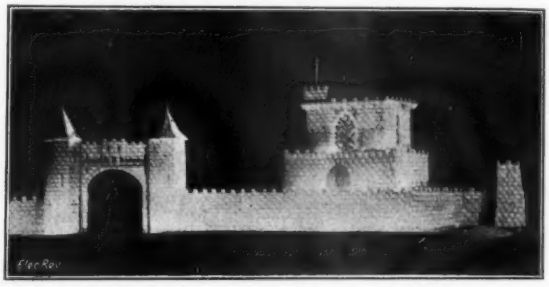
Sir Granville Ryrie, K.C.M.G., High Commissioner for Australia in London, supported the toast, and spoke of Australia's good work during the war and its immense resources which awaited development.

Sir Arthur Duckham, responding, said that the future of the British people lay in Empire development. Australia was ripe for developments, and to ascertain their scope was the mission's first task. In their preliminary work they had heard a good deal about the limitations imposed by Australian tariffs, but very little of the benefits arising from Australian preference for British goods.

Sir Hugo Hirst, who also replied, said that he had discovered many years ago that the business man was to be prominent in future affairs of State, and he had pointed out that while, no doubt, trade once followed the flag, to-day the situation was reversed. The war had shown how necessary business men were to a nation; in all countries they were called upon to run the huge organisation behind the armies. In spite of his home responsibilities, he was glad to respond to an opportunity of serving the Empire. In conclusion, he said that the electrical industry and Australia were in much the same position: one eye had to look towards the great potentialities, but the other had to be kept closely in the balance sheet. Vision, as Mr. Amery had said, had to be controlled by judgment.

Aldershot Searchlight Tattoo.

At the recent Searchlight Tattoo at Aldershot, in the presentation of the origin of the beating of "Tattoo" (first introduced by William of Orange), the castle shown in the accompanying illustration was floodlighted by some sixty G.E.C. projectors concealed in the surrounding moat and elsewhere, many of which were equipped with Osram amber-colour-sprayed gasfilled lamps. The cathedral within the castle was illuminated by large numbers of low-voltage lamps run off accumulators. This form of lighting also obtained in the tower of the cathedral, where it revealed the richness of the stained-glass window. During the presentation of "The



Floodlighted Castle at the "Tattoo."

Crusaders," a vision of "Jerusalem the Golden" was seen in the distance, over a mile from the grand stand, with its temples and towers flooded by a sea of soft golden light from hidden projectors. Later, a great "Fiery Cross" appeared in the distant blackness; the cross was some 30 ft. high by 20 ft. wide, and was constructed of steel tubing and "Fairyland strip." It was equipped with 20-watt sign-type lamps, and was hauled to the top of the flagstaff on Government House.

Another noteworthy feature of the Tattoo was the reproduction of a field of Flanders poppies; this patch of crimson with its white cross was revealed after the battle of the Menin Gate, with "Lest We Forget" standing out in illuminated letters in the background. The poppy field was lighted by means of a series of V-shaped battens let into trenches in the ground. These were equipped with Osram lamps, while a battery of G.E.C. floodlights concealed in the rough undergrowth aided the illumination of the setting. This striking scene was originated by Capt. A. J. Mayne, M.I.E.E., chief electrical engineer of the Aldershot Command.

The Daylight Sign Patent.

We reported in our issue of June 15th (p. 1043) that an application had been made by Mr. V. Bridgman for the grant of letters patent in respect of daylight advertising signs. We are informed by the Solaflex Co., which is interested in the Bridgman sign, that the Assistant Comptroller of Patents has decided to seal the patent, subject to amendments in two respects to clarify the claims of the inventor.

The North-West England Scheme.

The £9,000,000 scheme for the reorganisation of the electricity supply of the North-West of England and North Wales has aroused considerable interest in East Lancashire. Ald. T. E. Higham (Mayor of Accrington), chairman of the Mid-Lancashire Electricity Board, said that a meeting of the Board would consider the matter on July 9th; meanwhile the engineers would confer. It was a compliment to Accrington to be chosen as a selected station, though he would not say that in the long run it would make electricity cheaper.

There are hopes that Blackburn's station at Whitebirk may become a selected station, if arrangements can be made regarding the proportion of capital charges to be borne by the Board. Mr. P. P. Wheelwright, Blackburn's electrical engineer, pointed out that there was a clause in the scheme providing for the working of six other coal-fired generating stations under temporary arrangements between the Central Board and the owners, and these included Whitebirk Station.

Preston is to be the second largest station of the base-load stations in the north-west area. Preston Corporation assumed control of the station in 1921, when the output was 5,000,000 units per annum; since then the output has increased amazingly. Last year it was 37,000,000 kWh, and to-day it is

over 1,000,000 a week. Under the new scheme the load at Ribble Station will not be less than 200,000,000 units, and four years later it will be more than doubled. This will necessitate the erection almost immediately of a new generating station with a capacity of 100,000 kW to commence with, adjoining the present station. The new scheme will mean a saving to Preston of £6,100 a year, compared with the cost of generating a similar amount of energy if the station remained independent. The chairman of the Preston Committee said he was highly delighted with the position, for it indicated that the policy of his department had been conducted upon sound lines. One electrical engineer in Mid-Lancashire characterised the whole scheme as visionary. The idea of having stations about the country pumping into a network of feeders was very fine, but conflicted with practical experience. His argument was that competition should have full play. Asked if lack of electricity or its high cost was adding to cost of manufacture, he said if that were so, what of Tyneside and the North-East Coast? Electricity was cheaper there than anywhere, and yet trade was gravely depressed.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. DANE SINCLAIR, chairman and managing director of British Insulated Cables, Ltd., feeling it advisable, after many years of strenuous work, to reduce his activities, has relinquished the post of managing director, and Mr. G. H. NISBETT, J.P., M.I.E.E., who has been so closely identified with the career of the company since its early days, has been appointed to that office in his stead. Mr. Nisbett commenced his engineering career in 1883 by attending the City and Guilds Technical College under Professors Ayrton and Perry, and by becoming an articled pupil of Messrs. Paterson & Cooper, who, as many of our readers will still remember, were among the earliest manufacturers of arc lamps, dynamos, transformers, and telephones. Later he was appointed contract manager to that firm, carrying out many important electric lighting works all over this country. In 1890 he became chief assistant to

Mr G. H. Nisbett,
who has been appointed managing director of British Insulated Cables, Ltd.

Major-General Webber at a time when that gentleman was consulting engineer to the Brush Co. and to the City of London Electric Lighting Co. Shortly afterwards he joined the City of London Co. as chief electrical engineer, and, during his service with that company, he designed and laid down what was the first low-pressure alternating distributor system in this country, and probably in the world. Another innovation that he was responsible for at that time was the first use of lead-covered cables for underground distribution on a scale of any appreciable magnitude. In 1894 he joined what then was the British Insulated Wire Co. (now British Insulated Cables, Ltd.) as chief engineer; in 1902 he became chief engineer and manager; and in 1924 he was appointed director and engineer. As indicated above he has now become managing director of the company. We understand that Mr. Nisbett was the first to design a system of lead-covered cables for house wiring purposes, and was probably the first to use the conduit system for the wiring of buildings, in 1889, employing for the purpose rubber-insulated cables drawn into "compo" piping with wooden draw-boxes, the whole being buried in the plaster of the walls. He was the originator of the free wiring system, being the promoter (with others) of the National Electric Free Wiring Co. During his 34 years' service with British Insulated Cables, he has been responsible for many inventions connected with the art and practice of cable-making now in common use. Mr. Nisbett is a man of many activities and interests. He is a director of the Midland Electric Corporation for Power Distribution, Ltd., and chairman of the Lothians Electric Power Co., the National Electric Construction Co., the Electrical Finance and Securities Co., and several other important companies within that group.

The appointment of Mr. W. CHAMBERLAIN, of Leeds, to be manager of the Belfast Corporation Tramways Department at a salary of £2,250 was confirmed last week. The Lord Mayor (Sir Wm. Turner) informed the Corporation that Mr. Chamberlain had stipulated that the question of salary be reconsidered at the end of two years. He was evidently confident that he could pull the tramway undertaking through its difficulties.

Mr. S. T. ALLEN has been appointed "Central England Engineer" under the Central Electricity Board and has resigned his office as chief engineer and manager to the West Midlands Joint Electricity Authority which he took up two years ago when he left the Wolverhampton Corporation. Mr. Allen's address during the next three months will continue to be: c/o West Midlands Joint Electricity Authority, Phœnix Buildings, Dudley Road, Wolverhampton.

The Plymouth Corporation Electricity Committee has made the following appointments: Mr. F. HAYES, at present chief assistant, to be deputy engineer and station superintendent at £600 per annum; Mr. F. G. JONES, mains superintendent, Plymouth area, to be mains engineer for the whole area; and Mr. J. A. GOODALL, chief assistant, Newport Street, to be consumers' engineer for the whole area.

Poplar Borough Council Electricity Committee recommends that Messrs. W. H. MASKELL, A. A. CRAWFORD, and D. MURPHY be appointed maintenance engineers at £340 per annum.

The Stirling Town Council has increased the salary of the electrical engineer, Mr. WILLIAM R. MURRAY, by £75 a year.

Mr. HARRY MAY, of the Chesterfield Corporation electricity staff, has been presented by the staff and employés with a clock on the occasion of his marriage.

Mr. E. P. CARDEW, who is connected with British Insulated Cables, Ltd., was recently married to Miss D. L. NUTTALL, of Blackburn.

At the recent annual meeting of the National Electrical Manufacturers' Association (United States), Mr. H. B. CROUSE (president of the Crouse-Hinds Co., Syracuse, N.Y.) was elected President of the Association in succession to Mr. GERARD SWOPE, president of the General Electric Co.

Mr. J. ANDREW LEE has resigned his position as engineering inspector to the Electricity Commission, and has joined the staff of the Central Electricity Board. Mr. Lee has been on the staff of the Electricity Commission since its inception.

Obituary.—SIR JOHN I. THORNYCROFT, F.R.S.—We regret that Sir John Isaac Thornycroft, the celebrated naval architect and engineer, passed away on June 28th at his home, Steyne, Bembridge, Isle of Wight, at the advanced age of 85 years. The engine and torpedo works at Chiswick had their origin in 1864, when at 21 years of age he began to build small launches, but he went later to Palmer's Yard at Jarrow and to the University of Glasgow under Sir William Thomson (Lord Kelvin) to study engineering and mathematics, returning subsequently to Chiswick. The works grew and advances of one kind and another were made, including the introduction of the Thornycroft water-tube boiler; large operations in the building of steam wagons and petrol-driven commercial motor vehicles and motor cars at Basingstoke followed. Sir John was a familiar figure in the Engineering Section of the British Association for many years, and he read papers there and before the Institution of Civil Engineers, the Institute of Naval Architects, and other bodies. He had two sons, the elder being Sir John E. Thornycroft, who was knighted in 1918, and is managing director of the company, John I. Thornycroft & Co., Ltd., which has built up a reputation throughout the world. The second son is the general manager at the works at Basingstoke. The funeral took place on Saturday last at Bembridge, I.o.W.

MR. D. BROPHY.—The death occurred recently in Dublin of Mr. Daniel Brophy, traffic manager of the Dublin United Tramways Co. The deceased entered the service of the company 29 years ago as a clerk, and he was promoted to the position of traffic manager some 13 years ago.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Acme Wringers, Ltd.—Private company. Registered in Edinburgh on June 27th. Capital, £100,000 in 70,000 6½ per cent. preference shares and 30,000 ordinary shares of £1 each. Objects: To carry on the business of mechanical and electrical engineers, manufacturers of and dealers in machinery, implements, plant and apparatus, &c. The directors are:—T. W. Burt, "The Heugh," Bothwell, engineer; G. P. Burt, The Priory, Uddingston, engineer; P. Burt, Hollybank, Bothwell; J. S. Burt, 21, Queensborough Gardens, Glasgow; J. W. Burt, "Waverley," Bothwell. Registered office: 97, David Street, Mile End, Glasgow, S.E.

Morton Ejectors Co., Ltd.—Private company. Registered in Edinburgh on June 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in ejectors, injectors, ejector and other condensers, &c. The directors are: J. Black, 30, Highfield Drive, Kelvindale, Glasgow, engineer; A. Kelly, 461, Pollokshaws Road, Glasgow, brassfounder; G. W. Wilson, 6, Camphill Drive, Glasgow, iron merchant and quarry master. Secretary: J. Black. Registered office: 50, Wellington Street, Glasgow, C.2.

Bermuda Traction, Ltd.—Registered as a public company June 29th. Capital, £125,000 in £1 shares. Objects: To acquire all or part of the shares in and the first mortgage bond of the Bermuda Railway Co., Ltd., and the undertaking, properties, franchises, concessions and assets of that company, and to undertake all or part of the liabilities, to adopt agreements with (1) Bermuda Finance, Ltd., and (2) with the Bermuda Railway Co., Ltd., to construct and operate railways and tramways in Bermuda or other countries, to carry on the business of carriers of passengers or goods, manufacturers of and dealers in rolling stock, &c. The subscribers (each with one ordinary share) are:—F. A. B. Everington, 6, Austin Friars, E.C.2, solicitor; P. Edelston, 2, Austin Friars, E.C.2, director of companies; F. A. Bagnall, F.C.I.S., 2, Austin Friars, E.C.2; and four others. The first directors are to be appointed by the subscribers. Solicitors: Grundy, Kershaw, Sampson and Co., 6, Austin Friars, E.C.2.

Passmore, Gilhome & Co. (1928), Ltd.—Private company. Registered June 27th. Capital, £500 in £1 shares. Objects: To contract for and undertake the erection of buildings, to act as constructional engineers and builders; to manufacture and supply electrical plant and undertake electrical work of all kinds, &c. The subscribers (each with one share) are:—H. E. Wiltshire, 146a, Queen Victoria Street, E.C.4, company secretary; E. A. Froud, 146a, Queen Victoria Street, E.C.4, certified accountant. The first directors are not named. Secretary: H. E. Wiltshire. Registered office: 35, Craven Street, Charing Cross, W.C.2.

Pearsons Electricals, Ltd.—Private company. Registered June 29th. Capital, £100 in £1 shares. Objects: To carry on the business of engineers, founders, machinists, electricians, mechanical engineers and manufacturers, and workers of electricity, motive power and light, &c. The first directors are:—D. Simpson, 18, Ailsa Road, Westcliff-on-Sea, chemist; C. B. Mangold, 33, Elgar Avenue, Tolworth, Surbiton, company director; W. Lennard and A. J. Barton, addresses not stated. Registered office: 90, Fenchurch Street. E.C.2.

Fuller Electrical and Manufacturing Co., Ltd.—Private company. Registered June 28th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, producers and sellers of electrical, mechanical and any other kinds of machines, appliances and apparatus, &c. The subscribers (each with one share) are:—H. J. Fellowes, 56, Rathcoole Gardens, Hornsey, N.8; and W. C. Paske, 31, Amerland Road, Wandsworth, S.W.18, solicitors' clerks. Registered office: 5, Chancery Lane, W.C.2.

Aircraft and Universal Signs, Ltd.—Private company. Registered June 29th. Capital, £1,000 in £1 shares. Objects: To acquire from F. C. Armstrong and E. A. Houchin the benefit of a certain invention relating to advertising, and to carry on the business of designers and manufacturers of and dealers in electric, magnetic, revolving, changeable, movable, coloured, illuminated and other advertising signs, &c. The first directors are:—A. Allistone, Rosebank, Chertsey Lane, Staines, solicitor (chairman); F. C. Armstrong, 39, Somerset Road, North Harrow, engineer; Lt.-Col. E. A. Houchin, Essex House, 1, Stanwick Road, West Kensington, surgeon (all permanent). Registered office: 2, Clement's Inn, W.C.2.

Symper & Evershed, Ltd.—Private company. Registered June 29th. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on at 22, St. Anne's Road, Harrow, Middlesex, as "Symper & Evershed," and to carry on the business of electrical, mechanical and general engineers and contractors, &c. The joint managing directors are:—W. A. Evershed, "Highclere," Blacklands, Hastings; A. Evershed, 792, High Road, Leyton, E.10. Registered office: 22, St. Anne's Road, Harrow, Middlesex.

Vickers (Crayford), Ltd.—Registered as a private company June 29th. Capital, £400,000 in £1 shares. Objects: To acquire from Vickers, Ltd., and to carry on and extend that part of their undertaking at Crayford, and to carry on the business of mechanical, civil, electrical and general engineers, shipbuilders, armament and munition manufacturers, &c. The subscribers (each with one share) are:—F. D. Billett and J. Bennett, 2, Bond Court, Walbrook, E.C.4, clerks. The first directors are to be appointed by the subscribers. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.

British Turbo Engines, Ltd.—Private company. Registered June 25th. Capital, £200 in £1 shares. Objects: To carry on the business of designers, inventors and makers of and dealers in any internal combustion, steam, electrical, hydraulic, mechanical or other engine, turbine, dynamo or other power producing unit or plant, motor-cars, &c. The subscribers (each with one share) are:—F. D. Billett and J. 12, South Square, Grays Inn, W.C.1, managing clerk; P. G. Carr, 12, South Square, Grays Inn, W.C.1, clerk. The first directors are to be appointed by the subscribers. Registered office: 22, Church Street, Shaftesbury Avenue, W.1.

Stanfield Radio Co., Ltd.—Private company. Registered June 22nd. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in all wireless, telegraphic and telephonic apparatus, valves, instruments, and equipment, electrical, magnetic and radio-active instruments and apparatus, &c., and to adopt an agreement with the Stratford Auto & Wireless Co., Ltd., J. W. M. S. H. Menzies and others. The subscribers (each with one share) are:—E. J. Burrows, 29, Lyndhurst Road, Highams Park, E.4; and T. G. Greenleaf, 36, Sistova Road, Balham, S.W.12, solicitor's clerks. The first directors are to be appointed by the subscribers. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.

C. C. Fires, Ltd.—Private company. Registered June 25th. Capital, £3 000 in 2,500 7½ per cent. cumulative preference shares of £1 each and 10,000 ordinary shares of 1s. each. Objects: To acquire from I. Turner a sole and exclusive licence for the manufacture and sale of "improvements relating to gas or electric heating apparatus," the subject of Letters Patent No. 278,115, granted to him on July 17th, 1926, and to carry on the business of manufacturers of and dealers in gas and electric heating apparatus, &c. The permanent directors are:—H. S. Hewitt, 15, Regent Road, Surbiton, Surrey (director of Automotive Engineering Co., Ltd.); I. Turner, 19, Warren Avenue, Richmond, Surrey; A. V. Montgomery, 24, Heath Gardens, Twickenham. Solicitors: Wetherfield, Baines & Baines, 6, New Burlington Street, W.

Vidal Engineering Co., Ltd.—Private company. Registered company. Registered June 25th. Capital, £20,000 in £1 shares. Objects: To adopt an agreement with A. S. Kettelwell to develop and turn to account the business formerly carried on by him at Thornton Road, Croydon, as the Vidal Engineering Company, and to carry on the business of iron-founders, mechanical and electrical engineers, patentees and manufacturers of electric and other tools, agricultural implements, &c. The first directors are:—A. S. Kettelwell, Springfield, Grove Road, Sutton, retired shipowner; E. S. Richards, White Gates, The Drive, Sutton, solicitor; R. Waudby, Ladram, Temple Road, Epsom, engineer; A. Kettelwell, Springfield, Grove Road, Sutton. Secretary: C. F. Scott, 141, Dalmally Road, Addiscombe. Registered office: Vidal Engineering Works, Thornton Road, Croydon.

Official Returns of Electrical Companies.

North Wales Power Co., Ltd.—Trust deed dated March 30th, 1928, to secure £300,000 debenture stock, constituting a second charge on the company's undertaking and property, present and future, including uncalled capital. Trustees: Prudential Assurance Co., Ltd.

Surrender and charge, constituting a first charge on all land within the definition contained in the Law of Property Act, 1925, Section 205 (1) (IX), belonging to the company or to which it is now entitled, dated March 30th, 1928, as collateral

security to trust deed dated May 12th, 1924, securing £1,700,000 guaranteed first debenture stock. Trustees: Whitehall Trust, Ltd.

Surrender and charge, constituting a second charge on the above land, dated March 30th, 1928, as collateral security to the above trust deed of same date. Trustees: Prudential Assurance Co., Ltd.

Also surrender and charge, constituting a third charge on the above land, dated March 30th, 1928, as collateral security to trust deeds dated July 29th, 1919, &c., security £1,000,000 debentures. Trustees: Unity Investment Trust, Ltd., and Lord Morris.

Bideford and District Electric Supply Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. Return dated April 25th, 1928. 12,272 preference and 15,686 ordinary shares taken up and fully paid. Mortgages and charges nil.

Notting Hill Electric Lighting Co., Ltd. — Capital, £201,352 10s. in 20,000 cumulative preference shares of £10 each and 27,050 deferred shares of 1s. each. Return dated May 1st, 1928. All shares taken up. £201,352 10s. paid. Mortgages and charges, £79,000. Ditto guaranteed jointly and severally by this company and the Kensington and Knightsbridge Electric Lighting Co., Ltd., under powers of the Kensington and Notting Hill Electric Lighting Co.'s Act, 1899: £169,714.

English Electric Co., Ltd. — Capital, £5,000,000 in 1,500,000 preference and 3,500,000 ordinary shares of £1 each. Return dated May 14th, 1928. 983,565 preference and 1,664,023 ordinary shares taken up. £315,673 paid on 315,673 ordinary shares. £2,331,915 considered as paid on 1,348,350 ordinary and 983,565 preference shares. Mortgages and charges £2,545,714.

Jarrow and District Electric Traction Co., Ltd.—Capital, £60,000 in £1 shares. Return dated April 18th, 1928. 59,934 shares taken up. £49,945 paid. £9,989 considered as paid. Mortgages and charges, £1,400.

Windermere and District Electricity Supply Co., Ltd.—Capital, £65,000 in 5,000 6 per cent. cumulative preference, 5,000 7½ per cent. preference, and 3,000 ordinary shares of £5 each. Return dated April 14th, 1928. 5,000 cumulative preference, 2,000 7½ per cent. preference, and 3,000 ordinary shares taken up. £23,850 paid on 3,040 cumulative preference and 1,730 ordinary shares. £26,150 considered as paid on 1,960 cumulative preference, 2,000 7½ per cent. preference, and 1,270 ordinary shares. Mortgages and charges, £20,000.

Keswick Electric Light Co., Ltd.—Capital, £20,000 in 15,000 preference and 5,000 ordinary shares of £1 each. Return dated April 14th, 1928. 4,000 preference and 3,420 ordinary shares taken up. £3,420 paid. £4,000 considered as paid. Mortgages and charges, £10,100.

River Plate Electricity Co., Ltd.—Capital, £600,000 in £150,000 preference stock, £383,000 ordinary stock, and £67,000 ordinary shares of £1 each. Return dated April 25th, 1928. All stock and shares taken up. £109,937 paid. £490,063 considered as paid. Mortgages and charges nil. (The above 67,000 ordinary shares were converted into ordinary stock on May 15th, 1928.)

Wrexham Motor and Electrical Engineering Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1927 (filed March 3rd, 1928.) 1,428 shares taken up. £1,428 paid. Mortgages and charges nil.

Waste Heat and Gas Electrical Generating Stations, Ltd.—Capital, £350,000 in £1 shares. Return dated April 11th, 1928. 320,000 shares taken up. £320,000 paid. Mortgages and charges nil.

County Wireless Services, Ltd.—Capital, £500 in 400 preference and 100 ordinary shares of £1 each. Return dated December 31st, 1927 (filed March 14th, 1928). All shares taken up. £470 paid on 400 preference and 70 ordinary shares. £30 considered as paid on 30 ordinary shares. Mortgages and charges nil.

Weldrics (1922), Ltd.—Capital, £25,000 in £1 shares. Return dated March 29th, 1928. 15,500 shares taken up. £13,925 paid. £1,500 considered as paid. £75 calls unpaid. Mortgages and charges nil.

Electrical Supplies (Liverpool), Ltd.—R. R. Bailey, C.A., 10, Dale Street, Liverpool, was appointed receiver and manager by Order of Court dated June 6th, 1928.

Thompson, Ritchie & Co., Ltd.—Particulars filed of £4,000 debentures authorised May 9th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,400.

Worcester Electric Traction Co., Ltd.—Satisfaction in full on June 8th, 1928, of debenture dated March 28th, 1911, securing £10,000.

Electron Co., Ltd.—Satisfaction to the extent of £500 on April 18th, 1928, of debentures dated February 2nd, 1926, securing £1,400, and to the extent of £400 on the same date of debentures dated February 19th, 1926, securing £1,500.

City Notes.

Callender's Cable & Construction Co., Ltd.

The annual meeting was held on June 28th, Sir J. Fortescue Flannery, Bt. (chairman), presiding. In proposing the adoption of the report (*vide* our last issue, p. 1145), after alluding to the death of Mr. C. H. McEuen, and the appointment of Sir T. O. Callender as reputy chairman, the chairman said the result of last year's working was in all respects satisfactory, especially bearing in mind that 1927 was a year of waiting for the development of the great scheme of electrical distribution throughout the country which the Government had had in hand for some time past. The uncertainty as to the general details of the scheme had prevented many of the important electrical undertakings from proceeding with their own plans of development and extension. They found their operations seriously hampered, and it was a source of satisfaction that since the beginning of this year definite details of the Government's plans in some parts of England had been adopted, and the first contracts for the "grid" had been put in hand. Further extensions of that "grid" would be proceeded with immediately, and they hoped to secure a fair and reasonable share of the business. Referring to the agreement for a closer working arrangement between their company, British Insulated Cables, Ltd., and W. T. Henley's Telegraph Works Co., Ltd., which came into operation at the time of the last meeting, he was glad to say that already it was producing valuable scientific results. They could see that the extensions following on the Government's scheme would, in the near future, lead to developments in every section of the electricity supply industry, and the directors, with the view of making timely arrangements to be able to deal with any contingency that might arise, had decided to ask for powers to increase the ordinary capital by £500,000. It was not the intention to make any capital issue at the moment. The Anchor Co., practically all of which shares were held by Callender's, had again had a prosperous year, and had been able to increase its dividend. The American company, too, in which they were so largely interested, was progressing in a satisfactory manner. The difficulties inseparable from the start of such an enterprise had now been overcome, and the company was steadily advancing towards commercial prosperity. It had already obtained the technical prosperity which was so important, as it held one of the premier positions in electrical manufacturing in America.

Sir T. O. Callender, J.P., in seconding the motion, referring to the closer working arrangement of the three companies, said he had had the great advantage of close personal touch with the working of the arrangement. It was not to be expected that three companies, each of them large, prosperous and well-established, should roll themselves, so far as their business was concerned, into one organisation without a great deal of trouble and many differences of opinion, but he was really astonished to find how little of that had actually occurred. They took a very early opportunity of bringing all the various members together in one meeting and round one table, and, by the friendly words which the managements of each of the companies were able to give one another, they started to get going the team work which had existed during the past year. In no walk of business did team work prevail more than in contracting and in manufacturing where the manufactures were so highly technical as they were in their industry, and when they had three large companies, each having carried on business and having gained vast experience for many years, always in a different way from one another, but towards the same end, it was a great thing to bring those various men with all their practical experience and their deep physical knowledge and research together to work to one common end and for one common purpose. They had been able to do that. They had also learned much on the commercial side. They all of them knew better than they did before where to go for the purchase of their material; where they could get it best and how they could do best in the management of various other things, in what machinery they could make improvements, and how they could cheapen production generally. It was not for themselves they were doing this; it was really for the whole of the electrical industry, and he was thoroughly convinced that seldom, if ever, had a union of forces been brought about that would prove so efficient and so useful to the community as the organisation which was now known as "Cable Research." They started with the three companies that the chairman had mentioned. They had already added another three to their number, and he did not think the time was very far distant when they would have added a few others to help them and to increase the activity of that organisation. He thought it was very wonderful to find three companies who had been in keen competition in the past now sitting down together for the general good of the industry. It had been very annoying at times to find that work which they had confidently anticipated and for which they had made arrangements, was hung up with no definite idea as to when it would be carried out, owing to the Government's scheme. If, however, one looked at the matter calmly, no other course was possible. They could not expect those in charge of undertakings to take risks until they knew what the Government intended to do. Only that day they were sending out a tender for the

immense scheme in the South-Eastern area of England for the overhead distribution lines, the cost of which would run into some millions of money. It was not likely to be given to any one company; it would probably be divided up. There had been one phase of work last year which had been very interesting—he meant the purely local development that had taken place. A couple of years ago the various undertakers supplying electricity confined themselves to a small area round about the central generating station, with no idea of going beyond the purely municipal boundaries, and sometimes not even as far as that. During the last two years, however, steps had been taken to enlarge their boundaries, and now in nearly all parts of the country they found outside the suburbs of both large and small towns, places being adequately supplied with electricity. All that had meant a certain amount of work, but it was nothing to what would be required in the more or less near future, and there again they looked forward with great confidence. A further important development which had taken place was with regard to the use of electricity for cooking and heating. Referring to their foreign work, he said that there had been comparatively few large contracts about, and those had been fought for bitterly. They had, however, had a very fair share, although they were not satisfied. Despite the troubles in China the company was still keeping up its offices in Shanghai with a competent staff and a considerable supply of stock. One would imagine that during the last two years China had been dead for business, but it was really not so. Quite a good amount of trade had been done there and paid for. Although their offices in Shanghai had not been paying during those years, the amount which they had had to draw for maintenance from the company was quite small, and he believed the expenditure would be worth many times the cost to them in the future when China resumed, as it would do in a few years, its position in the trade of the world.

The report was adopted, and subsequently the resolution for the increase of the capital was also agreed to.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

Ever Ready Company (Great Britain).—1,480,000 ordinary shares of 5s. each, fully paid, Nos. 200,001 to 1,680,000.

Midland Electric Corporation for Power Distribution.—350,000 ordinary shares of £1 each, fully paid, Nos. 350,001 to 700,000.

Underground Electric Railways Company of London.—13,327 ordinary shares of £1 each, fully paid, Nos. 5,501,170 to 5,514,496.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Altrincham Electric Supply, Ltd.—10,000 new 7 per cent. second cumulative preference shares of £1 each, fully paid, Nos. 53,351 to 63,350.

Baird International Television, Ltd.—1,000,000 "A" shares of 5s. each, fully paid, Nos. 1 to 1,000,000.

Falk, Stadelmann & Co., Ltd.—450,000 7 per cent. cumulative preference shares of £1 each, partly paid and fully paid, Nos. 1 to 450,000; 112,500 new ordinary shares of £1 each, issued at £1 2s. per share, partly paid and fully paid, Nos. 363,418 to 475,917; 363,417 ordinary shares of £1 each, fully paid, Nos. 1 to 363,417.

Aktiebolaget Elektrolux.—200,000 "B" shares of S.Cr. 100 each, Nos. 60,001 to 260,000.

Brush Electrical Engineering Co., Ltd.—6,950 ordinary shares of £1 each fully paid, Nos. 469,452 to 476,401.

Underground Electric Railways Co. of London, Ltd.—29,502 ordinary shares of £1 each fully paid, Nos. 5,514,497 to 5,543,998.

Urban Electric Supply Co., Ltd.—160,000 ordinary shares of £1 each fully paid, Nos. 240,001 to 300,000 and 700,001 to 800,000.

British Electric Traction.—13,262 new ordinary shares of £1 each, fully paid, Nos. 199,230 to 212,481.

North Wales Power Co., Ltd.

The annual meeting was held on June 27th, Mr. Kenneth M. Clark, J.P., presiding. In moving the adoption of the report and accounts (*vide* our last issue, p. 1146), the chairman said that during the past year 87 miles of transmission lines had been completed, bringing the total length up to 340 miles. The principal lines were those extending the supply to Oswestry, interconnecting Wrexham and Legacy sub-station with Hawarden sub-station, and making a supply available to the Mold Urban District Council. The lines duplicating the service to Rhyl Urban District Council and giving a supply to the Prestatyn Council had also been completed. The 66,000-V line between Legacy and Crewe would shortly be brought into commission, and the 66,000-V line between the new Maentwrog station and Legacy was nearing completion. They expected to commence supplying from the Maentwrog station almost immediately, and if the water conditions were satisfactory the station should be operating at full capacity before the end of July. That would enable the company to cut down its outside purchases of energy; negotiations were now proceeding for favourable modifications in the present agreements for the purchase of electricity. In association with the Electricity Distribution of North Wales & District, Ltd., they were now affording bulk supplies to a further 40 towns and villages, and that number would be augmented in the near future. Up to the present the company had been able to generate only 20 per cent. of its requirements, but with the completion of the Trawsfynydd dams and the Maentwrog station it was estimated that, in 1929, it would be able to produce 75 per cent. Their consulting engineers had advised the extension of the company's watershed and storage capacity to enable the company to meet future requirements, and the directors had decided to negotiate for the further capital necessary to enable the work to be carried out. In collaboration with the North Wales & South Cheshire Joint Electricity Authority, the company had represented to the Electricity Commissioners that the development of electricity supply in unremunerative rural areas could only be carried out by some form of Government assistance.

Aluminium Corporation, Ltd.

This company's report was reviewed in our last issue (p. 1146). The annual meeting was held on June 26th, when Mr. K. M. Clark (chairman), who presided, said that it was hoped that the £231,280 which had been provided would represent the full amount of the company's loss in connection with the Eigiau Dam disaster and the reconstruction work rendered necessary by that unfortunate event. The trading for the year had shown a distinct improvement due to the increase in the output of metal from their own furnaces and to the normal increase in the demand for energy by the North Wales Power Co. The percentage of working costs had been reduced by steady efforts towards efficiency and economy. The sales of electricity to the North Wales Power Co. would decline when that company put its new station into commission in a month or two, and owing to the recent serious fall in the price of aluminium the future profits would be affected. On the other hand they had secured the selling rights of the whole of the output of their Norwegian associate and received from it all their requirements of aluminium for their rolling mill at a preferential price, besides earning a commission upon sales to other consumers. Mr. Clark pointed out that the company was not an electricity supply undertaking. The bulk of the energy which it produced was used in the works; the balance was sold to the North Wales Power Co. under an agreement approved by the Electricity Commissioners. During 1927 the company had thus disposed of 17,365,000 kWh, bringing in a revenue of £54,268. In conclusion, the chairman said that the suggested issue of funding certificates on account of the arrears of dividend on the preference shares was before the board, but that matter was inseparable from the question of reconstruction, which was at present engaging their serious attention.

Globe Telegraph and Trust Co., Ltd.

Sir John Denison-Pender, G.B.E. (chairman) presided at the annual meeting on June 26th. In presenting the report and accounts (ELEC. REV., June 22nd, p. 1102), he said that the only item calling for comment was the disposal of the company's shares in the Great Northern Telegraph Co. That action was taken in view of the disturbed conditions in China, where the Great Northern Co. was greatly interested; the high prices of the shares gave the directors a favourable opportunity of selling them and a profit of £9,770 was realised. The proceeds would be re-invested as suitable opportunities arose, but it was becoming very difficult to purchase telephone and telegraph securities, to which the company was limited. During the year they had been allotted 100 ordinary shares in the United River Plate Telephone Co. at par, and they were to receive 100 new shares of the American Telephone and Telegraph Co. at par. Negotiations were still proceeding with respect to the American Telegraph & Cable Co. A committee had been formed, on which the company was represented, to discuss the matter with the Western Union Telegraph Co., but up to the present no scheme had been put before the shareholders. Referring to the proposed cable-wireless merger, the chairman said that further progress awaited the report of the Imperial Cable and Wireless Conference which had been examining the question for nearly six months. The Eastern and Associated Telegraph Companies continued to carry a larger volume of traffic than the "beam" services in spite of the lower rate of the latter. It was clear, therefore, that the cables still held a definite and important part in the communications of the world. At the same time they could not afford to lose the traffic which the wireless system at a lower rate took away from them.

The Swedish Elektrolux Company.

Last week the Aktiebolaget Elektrolux, Stockholm, published, for information only, particulars of its constitution, capital, and objects. The company has a capital of 60 million Swedish crowns (about £3,300,000), and it was formed as the first of a series of selling organisations in different countries in order to place an electric vacuum cleaner manufactured by A.B. Lux, Stockholm, on the world's markets. These selling organisations were independently financed but guided by a united policy. In 1926 the sale of a refrigerator was added to the activities, and later other appliances were taken up. The company now owns or controls manufacturing companies in Stockholm, Paris, Berlin and London (Electrolux, Ltd.); patent companies in Schaffhausen and Stockholm; and selling companies or branches in 21 countries. The allied undertakings have made steady continuous progress. Application has been made for permission to deal in 200,000 100 cr. "B" shares on the London Stock Exchange. This number of shares has been acquired by the British, Foreign and Colonial Corporation, Ltd., and Higginson & Co.

W. T. Henley's Telegraph Works Co., Ltd.

The report for the year ended March 31st last records a profit of £342,291, as compared with £306,985 in 1926-27. After meeting debenture interest, depreciation, &c., and adding a net balance of £503,203 brought forward, the amount available is £786,277. The allocations include £50,000 to reserve (as last year), and the final ordinary dividend is 2s. 6d. per share, plus a cash bonus of 1s. per share, making 5s. per share for the year, as before. A balance of £532,931 is carried forward. The directors report that the business for the year has not differed materially from the previous year. The works have been fairly well employed, and the small increase in profit is due to expenditure on capital account, which has increased the works production. There was a great improvement in the business of the company's subsidiary—Henley's Tyre and Rubber Co., Ltd. Besides an improvement in turnover, the stability of the price of raw rubber during the year has materially helped in producing better results than the company has shown during the past few years. Meeting: July 13th.

Brazilian Traction, Light and Power Co.

The total income from subsidiaries and investments for the year ended December 31st, 1927, was $12,526,241 (Canadian). After meeting expenses and general amortisation the net revenue is $11,947,669. Total dividends of 6 per cent. have been paid on the preference and ordinary shares, leaving a surplus of $5,001,813, to which is added $7,892,093 brought forward. Of this $4,000,000 has been transferred to general reserve and the balance carried forward. As the result of the capital changes made recently, the company now has about $23,000,000 with which to meet capital requirements, present and in the near future.

Petters, Ltd.

The report for the year ended March 31st last show a net profit of £25,634 after providing for depreciation, taxation, &c. The preference dividend is paid, and provision is made for the redemption of and interest on the funding certificates. The reserve fund receives £5,000 (making £75,000) and a dividend of 6 per cent. is recommended on the ordinary shares (as for 1926-27), leaving £25,545 to be carried forward. The directors consider the results satisfactory in view of the prevailing conditions in the engineering industry. Reference is made to the closing of the Ipswich works at the end of this year. Meeting: July 12th.

Falkirk Iron Co., Ltd.

The net profit for the year ended March 31st last was £16,701, as compared with £48,599 in the preceding year. With the balance brought forward the amount available is £52,385. A final dividend of 2 per cent. is to be paid on the ordinary shares, making 6 per cent. for the year, against 10 per cent. for 1926-27. A balance of £32,931 is carried forward, which, it is estimated, will cover liability for taxation and leave a satisfactory margin.

Parkinson & W. B. Cowan, Ltd.

The directors of this company, which controls a number of gas and electricity meter manufacturing concerns, announce their intention of issuing 50,000 7 per cent. cumulative preference shares of £1 each at 20s. 6d. per share and 100,000 ordinary £1 shares at 24s. per share. These will be offered to existing shareholders. It is anticipated that the final ordinary dividend will be 7½ per cent., making 10 per cent. for the year.

W. & T. Avery, Ltd.

The profit for the year ended March 31st last was £99,524, and the addition of £52,451 brought forward makes available £151,975, against £137,592 in 1926-27. A dividend of 10 per cent. is to be paid on the whole of the ordinary shares, making 15 per cent. for the year in the case of the old shares. The allocation to reserve is reduced from £18,000 to £10,000 and £55,987 is carried forward.

Pernambuco Tramways and Power Co., Ltd.

The directors announce their intention of redeeming the whole of the 10-year notes on October 1st at par, with accrued interest. It is also proposed to redeem the outstanding 8 per cent. prior lien debentures at £105 per cent. on January 1st, 1929.

General Electric Co., Ltd.

The annual meeting was held on Tuesday last, Sir Hugo Hirst, Bt. (chairman), presiding. A full report of his speech will appear in our next issue.

Shawinigan Water and Power Co.

At a meeting last week the directors were authorised to issue, as and when necessary, 1,000,000 additional shares of stock. It is reported that no immediate issue is contemplated.

Traction and General Investment Trust, Ltd.

An interim dividend of 6 per cent. (against 4 per cent.) has been declared on the ordinary stock, and one of 1s. 11d. per share on the new shares.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The directors have declared a dividend of 5s. per share, free of tax, in respect of the quarter ended March 31st last.

Cork Electric Supply Co., Ltd.

An interim dividend of 1s. per share (against 7 1/5d. per share) has been declared on the ordinary shares.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The directors have declared an interim dividend of 9d. per share on the ordinary shares, payable July 21st.

Telegraph Construction and Maintenance Co., Ltd.

An interim dividend of 2½ per cent., free of tax, has been declared, as last year.

Eastern Telegraph Co., Ltd.

A dividend of 2½ per cent., free of tax, has been declared on the ordinary stock in respect of the quarter ended June 30th.

Aron Electricity Meter, Ltd.

A dividend of 4 per cent. has been declared upon the ordinary shares for the year ended March 31st last, against 6 per cent. for 1926-27.

Stocks and Shares.

MONDAY EVENING.

THOSE who follow the markets in stocks and shares connected with electricity supply, power and cable securities, cannot complain that they have been neglected in the ministration of items of interest that serve to keep alive the public attention paid to their investments. In the week just ended, there has been a series of mild excitements connected with wireless and cable issues, with Home Railway stocks, with Latin-Canadian utilities, and, to a smaller extent, with a number of industrial shares. There is a good deal of business being done, although the general activity in Stock Exchange markets is not a quarter of that which was prevailing a couple of months ago. The industrial boom and its subsequent break have led up to an aftermath of financial trouble which has been apparent mostly in Brussels, but which has forced its reaction, not only on to New York speculators, but on to the London markets as well. As we have already pointed out, the effect of these shocks has touched but slightly the particular departments with which these paragraphs are concerned; except, of course, as regards those dealing with what may be called the gambling counters of the Stock Exchange.

Railways and Road Transport.

The Parliamentary Joint Select Committee has found proved the preamble of all the Railway Road transport Bills, except that of the Metropolitan Railway. The six Bills are held proved subject to the condition that traffic in the administrative County of London is excepted, and that protection be afforded to various statutory tramway, trolley and omnibus undertakings. The effect of this in the Stock Exchange was to bring about a substantial rise in Home Railway stocks, of what are still called the steam lines, while in the Tube group the outstanding feature is a material recovery in the prices of Underground Electric Railways of London issues. The Underground income bonds have risen 6 points to 128; the shares are 1s. up at 27s.; Districts, after being unaccountably flat, suddenly recovered and at 76 are 2½ better on the week. Metropolitan consolidated at first gave way by reason of the Parliamentary Committee's decision, but it is considered certain that, sooner or later, the Metropolitan will be found so necessary to the Underground group that its absorption is merely a matter of time; and the price at 69½ is 30s. to the good. The Road Powers Bills may have important consequences for tramway and omnibus undertakings, though it is assumed that the railways will go to work very quietly at first in order to avoid any collision with existing companies.

Eastern Cables Boomlet.

Extraordinary rises have occurred in the Eastern Telegraph quartette, the Eastern Telegraph ordinary stock, for instance, rising as much as 20 points in a single day, with the shares of the Eastern Extension, Western and Globe Companies following suit. Marconis also spurted, and although the jump in prices induced a certain amount of selling, optimism prevails in regard to the eagerly-awaited statement which has been looked for during the past two months, that will explain the Government attitude towards the whole question of communication as it is at present carried out by the wireless, the cable, and the beam systems. As the details may be published at any moment, it seems a little superfluous to do more than reflect the advance hopes that have been formed; but it will be noticed by reference to our price lists, that quotations are very considerably higher on the week. Eastern ordinary is up 26: Eastern Extensions and Westerns rose 70s. each. In the event of a holding company being formed, as expectation suggests, the impression prevails that Eastern ordinary would be exchanged for other stocks which, from the outset of dealings, should be worth the equivalent of at least £275 per £100 of the present Eastern Telegraph ordinary. On the other hand, the less optimistic maintain that the Government will never consent to an increase in charges, and that it is futile to expect such improvement in the dividends as would justify the advancement of prices to a much higher level than prevails to-day. Indo-Europeans are £2 better at 44½.

Marconi Old and New.

So far as Marconis are concerned, critics point out that the £1 fully-paid shares stand at 4¼, whereas the 10s. shares are quoted at 67s. 6d., and they deduce from this that either the ordinary are too low, or that the 10s. shares stand too high. It has been explained here on a previous occasion that no necessary connection of 50 and 100 exists as between the £1 fully-paid shares and the 10s. fully-paid shares of the Marconi Company, insomuch as the former arose through conversion of the company's 6½ per cent. debentures, whereas the latter stand on a different foundation, and were cut down six months ago, from being £1 shares to their present denomination through the process of writing off 10s. per share. The dividend that is about to be declared in respect of the earnings for 1927 will affect the £1 shares as well as those of the older issue, although the latter did not come into being until the beginning of April. So many mistakes have been made during the past few days by people claiming to be authorities on the matter that it is a little ironical to observe the date on which these £1 shares actually appeared, namely, April 1st. As for writing back the 10s. that was taken away from the senior issue last November, some doubt may be expressed in regard to this, in view of the shortness of the time that has elapsed.

New Issues.

Marconi Marines have strengthened, and the group shows a good deal of vitality as a whole. Baird Television new shares proved very popular, and were largely over-subscribed. The market opened on Monday at a premium of 2s. 9d. over and above the shilling premium at which the 5s. shares were offered; that is to say, the market price of these 5s. shares is now about 8s. 9d. Amongst other new issues, Scottish Power have risen to 2s. 9d. premium, it being argued that the shares are worth something like 4s. premium in view of the fact that before they came out, the old stood at nearly 31s., whereas the new, offered at 26s., miss no more than one dividend, the value of which is expected to be about 1s. Midland Counties Electric new ordinary are quoted at 4s. 10½d. premium. The new Tokyo sixes have strengthened to 3 premium: there is a call of 25 per cent. due on these bonds on July 13th, leaving a final 35 per cent. to be paid on August 17th, to make the £90 at which the bonds were issued. Investors continue to buy shares in the sound Power Companies because they hope to receive preferential treatment in the allotment of new shares that will be made as the companies extend their operations.

Ringing-up Mexico.

The Post Office announces that the telephone service has just been established between this country and Mexico, the charge to be £12 for a call of three minutes, with £4 for each additional minute or part thereof. Mexican Utilities are quiet, failing to recover from the heaviness which overtook them last week. Anglo-Argentine Tramways preference shares of both classes are ex dividend, allowing for which, the prices are dull, the first preference being ¼ down at 3⅞. Perak Hydro-Electrics eased off to 20s. Hydro-Electrics are 54½. Brazilian Tractions at 59½ are 5 up.

Equipment Shares.

Callender's meeting produced a very interesting speech from the chairman, which, however, had no effect upon the price of the ordinary shares. The latter remain at 4¼. The 6½ per cent. preference at 23s. 9d. recovered the dividend and gained a further ninepence. These, by the way, are as sound a preference investment as most people can require, and pay 5½ per cent. on the money. Enfield Cable preference at 26s. 3d. are ex dividend, regaining the deduction. Metropolitan-Vickers ordinary are a little harder, and General Electrics have been a good market, with a rise to 39s. 6d. on issue of the report. This shows an increased profit of £27,000 as compared with 1927, and although the amount is less than that required to pay the extra 2½ per cent. which raises the dividend to 10 per cent., the carry-forward of £338,456 is £4,500 up, while the depreciation and reserve of £325,433 is £10,000 lower than the figure of a year ago. Henley's Cable gave way ⅛ to 5¾: English Electrics are 6d. up at 8s. The general list of electrical manufacturing and equipment shares is steady. Aron Meters are dull on declaration of a 4 per cent. dividend, as against 6 per cent. a year ago. Amongst engineering descriptions, Babcocks can be sold at the officially-quoted 67s. 6d.; Vickers have strengthened to 12s. Armstrong remain at 3s. 1½d. The rubber market is placid to stagnant.

Electricity Supply.

Reference has been made already to the steady demand for shares in the provincial group of power companies. Yorkshires continue to improve, and are 6d. higher at 34s. 6d. In the London list, Bromptons put on 1s. at 26s. 6d., thus coming more into line with others of their class. A gain of 2s. 6d. lifted Metropolitan Electrics to 47s. 6d. and aroused fresh rumours of the "taking-over" variety. County of London rallied to 36s. 6d. buyers, looking a better market again. South Metropolitan preference put on 1/16 to 26s. 3d. Outside these, Calcutta Electric rose to 53s. 3d. No change occurred in Victoria Falls and Transvaal Power ordinary on the declaration of a 12 per cent. final dividend, making 15 per cent. for 1927-28. The preference receive 10 per cent. for 1927 and 3 per cent. for the half-year ended last Friday. Similar rates were paid for the previous year.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1926.	Dividend. 1927.	Price July 2, 1928.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14†	15	2⅛	—	... ...
Brompton Ordinary	1	8⅜	8½	26/6	+1/-	5 5 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	26/6	—	5 5 8
City of London	1	10	10	30/9	—	4 11 1
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Clyde Valley	1	8	8	33/6	—	4 3 0
County of London	1	7½	7½	36/6	+6d.	4 2 4
do. do. 6% Pref. ...		6	6	23/-xd	+6d.	5 4 4
Edmundsons' 7% Pref.		7	7	25/6	—	5 9 10
Elec. Supply Corporation		11	11	51/3	—	4 5 9
Kensington Ordinary		8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	8½	26/6	—	5 5 10
Metropolitan	1	8	9	2⅜	+⅛	3 16 0
do. 4½% Pref.	1	4½	4½	17/6xd	+3d.	5 2 10
Midland Counties	1	6	6½	30/-	—	4 6 8
Mid. Elec. Power	1	—	15	40/-	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	26/3	—	4 11 5
do. 7% Pref. ...	1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10⅞xd	+⅛	5 11 7
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/-	—	5 3 8
Scottish Power	1	8	8	29/6	—	5 10 4
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	31/3	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	2-/3	-6d.	6 9 0
Yorkshire Elec.	1	8	8	34.6	+6d.	4 12 9

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	73	—	5 9 7
Metropolitan	,,	3	3	69½	+1⅛	4 6 3
do. District	,,	3½	4	76	+2½	5 5 3
Underground Electric	£1	1½	5	27/-	+1/-	3 14 1
do. do. Income ...	Bonds	6	6	128	+6	4 18 9

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	100½	—	5 19 5
do Def.	,,	1½	1½	24½	-⅛	6 5 0
Automatic Telephone	1	10	10	45/-	—	4 9 0
Eastern Extension	10	10	10	24½	+3⅛	*4 2 5
Eastern Tel. Ord.	Stock	10	10	248	+26	*4 2 4
Globe Tel. and T. Ord.	10	10	10	24xd	+2½	*4 3 4
do. do. Pref.	10	6	6	11xd	+⅛	5 9 1
Great Northern Tel.	10	20	20	39xd	—	5 2 7
Indo-European	25	10	10	44½	+2	*5 12 4
Marconi	10/-	5	—	67/6	+½	0 14 9
Marconi-Marine	1	8½	12½	48/-	+2/-	5 4 2
Oriental Telephone Ord. ...	1	12	12	58/9	+⅛	*4 9 3
United R. Plate Tel.	5	8	8	11⅛	—	*8 12 0
Western Telegraph	10	10	10	24	+3⅛	4 3 4

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅝xd	-⅛	7 11 9
do. do. 2nd Pref. ...	5	6	6	8½xd	—	8 2 8
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 11 2
British Electric Traction Def. Ord.	,,	—	—	500xr.	—	... ..
do. do. Pref. Ord.	,,	8	7½	121½xd	—	6 0 6
Brazil Traction	100	6	7	59½	+5	2 18 10
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	98½	+2	5 1 6
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	9/6	—	... ..
London United Tram Deb. ...	Stock	4	4	63½xd	+1	6 13 3
Mexico Trams, 5% Bonds	—	5	5	8⅝	—	5 17 0
Mexican Light Common	100	Nil	Nil	75	—	... ..
do. 7% Pref...	100	Nil	7	79	—	8 17 2
do. 1st Bonds	—	5	5	83½	—	6 1 3
Yorkshire (West Riding)	1	Nil	Nil	7/6	—	... ..

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	46/3	—	*4 6 7
British Elec. Transformer Pref. ...	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4¼	—	3 13 6
Brush Ord.	1	10	10	25/9	—	6 19 4
Callenders	1	15	15	4¼	—	3 10 6
do. 6½% Pref.	1	6½	6½	23/9	+1/16	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	—	18/-	—	... ..
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	£/-	10	10	12 6	—	3 4 6
do. 5% Deb.	Stock	5	5	88xd	—	5 13 8
Electric Construction	1	7½	7½	27 6	—	5 9 1
Enfield Cable Pref.	1	7½	7½	26/8xd	+9d.	5 14 3
English Electric	1	Nil	Nil	8/-	+6d.	... ...
do. do. Pref.	1	8	Nil	11/8	—	... ..
Gen. Elec. Pref.	1	6½	6½	24⅞xd.	—	5 6 1
do. Ord.	1	7½	10	33/6	+1/6	5 1 8
Henley	1	25	25	5¾	-¼	4 7 0
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 0
India-Rubber	1	Nil	Nil	15/-	—	... ...
Johnson & Phillips	1	12½	10	42 6	—	4 14 1
Met.-Vickers Ord.	1	8	6	32/6	+6d.	3 13 10
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	27/6	—	5 9 1
Telegraph Construction	12	10	10	25½	—	*4 18 0

* Dividends paid free of Income Tax.

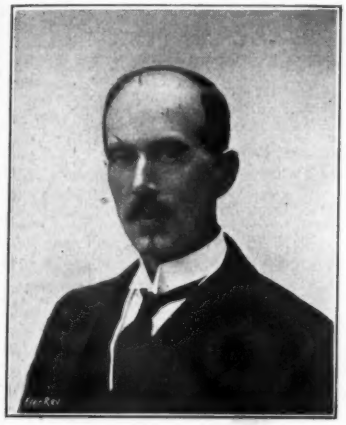
† 4% of which was Tax Free.

Scottish Electrical Contractors.

Annual Meeting and Golf Competition.

THE annual meeting of the Electrical Contractors' Association of Scotland was held in the Society of Arts Hall, Edinburgh, on June 21st, when there was a large attendance of members representative of the branches throughout Scotland. Mr. James Allan (Malcolm & Allan, Ltd.), president, occupied the chair.

Reports from the Central Board and the various standing committees of the Association were submitted, particular attention being paid to the fair-trading problem which is the subject at present of a conference frequently meeting in London in which all sections of the industry are represented.



Mr. J. J. Foggo,
President of the E.C.A. of Scotland.

The constitution of the Association had not been revised since 1912, and the draft of a new constitution was finally approved for future use. The institution of a presidential badge which had been presented by the secretary, Mr. Finlay, in celebration of the fact that the Association had been in existence in one form or another for 28 years, was referred to, and during the meeting small replicas of this badge were presented to all past presidents as a memento of their period of office. It was reported that in the course of the year a benevolent fund had been instituted, which had already received substantial support from the various branches and their individual members.

The following office-bearers for the ensuing year were elected: President: Mr. J. Johnston Foggo, A.M.I.E.E., Edinburgh; vice-president: Mr. Walter Bennett, Glasgow; secretary: Mr. Walter Finlay, W.S., Edinburgh, and a Central Board of 15 members representative of the four branches.

After the annual meeting the members present proceeded by motor-car to Cramond Brig Golf Club, where the party partook of lunch, the past and new office-bearers being toasted. In the afternoon an enjoyable golf match, Glasgow *v.* the Rest of Scotland, was held, in which Glasgow was the victor by a majority of two matches. A half-crown sweepstake for the best score was also instituted on behalf of the benevolent fund, which benefited to the extent of over £7.

The National Physical Laboratory.

Annual Inspection by the General Board.

THE annual inspection of the National Physical Laboratory by the General Board took place on June 26th, when a large number of visitors were received by Sir Ernest Rutherford, O.M., president of the Royal Society and chairman of the Board, Sir Richard Glazebrook, K.C.B., F.R.S., chairman of the Executive Committee, and Sir J. E. Petavel, K.B.E., F.R.S., director of the Laboratory.

The engineering department had many interesting pieces of apparatus on view, among which were instruments for recording both vertical and horizontal ground disturbances, due to traffic, machines for the testing of spring plates under uniform bending moment, and a very pretty piece of apparatus wherein a continuous stream of air is drawn across a water bath and the wave-motion thus formed is studied by means of a ground-glass screen, or the effect may be photographed.

In the Ministry of Transport shed a very interesting demonstration was given of the different modes of skidding of vehicles. A small model skeleton chassis, with an automatic device for applying almost any combination of brakes after a few yards' run, was employed.

It was interesting to note that the valve-operated high-frequency furnace is apparently becoming a more recognised piece of apparatus, partly due to its greater reliability as compared with other forms.

In the Physics Department experiments in sound photography were demonstrated. This is carried out in an extraordinarily small space, by means of a wooden model section of an auditorium wherein an electric spark is made to create a sound impulse at a point representing the source of sound, and a second spark, occurring at a definite time-interval, is photographed; since the light from the second spark has to pass through air at varying densities, representing varying air pressures, the diffraction of the light gives a true indication of the air pressures at that instant.

The Electricity Department was a fine example of the intricacy and accuracy with which electrical measurements are now being made. Accuracies of 1 in 10,000 and 1 in 100,000 seem to be the order of the day, emphasising the skill with which external causes of error have been eliminated. Interesting examples of this were to be found in the apparatus for the determination of the ohm in absolute units by Albert Campbell's method, and in the apparatus for measuring the effective self-inductances and resistances of iron-cored chokes carrying both direct and alternating current, both components being adjustable to any desired amount. A new method of measuring the mutual conductances of thermionic valves by means of an alternating-current bridge was of interest, the reading being actually recorded in ohms.

Various types of screened valve oscillators and wavemeters were also on view, as was also an interferometer for examining piezo-electric quartz crystals whilst under electric vibration.

In the wireless huts, all forms of transmitters, receivers, and wavemeters, from 2 to 20,000 metres, were on view. It was of interest to note that for the very special transmitter operating on 2 metres it had been necessary to employ valves having extremely small gaps between their electrodes.

Delegates to the Annual Meeting of the Electrical Contractors' Association of Scotland.

The I.M.E.A. in the West Country.-V.

A Report of the Proceedings and Social Functions of the Annual Convention at Bath.

Selling More Electricity for Domestic Purposes.

(Abstract.)

By LIEUT.-COL. W. A. VIGNOLES, D.S.O.

Under the 1926 Act the majority of electricity supply undertakings will cease to be troubled with the problem of generation, and they will eventually buy either directly or indirectly from the Board, not units of electrical energy at a price per unit, but: (a) kilowatts according to the "demand" at the period of peak load, and (b) units of electrical energy according to the amount required by them. It is suggested, therefore, that all undertakings should adopt a two-part tariff with an alternative flat rate, kept at a comparatively high figure, say, 6d. to 8d. A suitable two-part tariff might be divided into sections: (A) for domestic purposes, under which a fixed charge would be arranged according to the size of the house (this can be based on ratable value, or, what is probably better, on floor area or number of rooms); and (B) for business premises, shops, theatres, &c., where the fixed charge would be based on the kilowatts of maximum demand. In both these cases the fixed charge should cover all standing charges, and the running charge should be fixed as low as possible. The development of the use of electricity for the greatest variety of purposes is the surest way to reduce costs. The object should be to encourage the growth of a longer-period load, and the sale of the maximum number of units to each consumer. A return obtained by the British Electrical Development Association shows that in 248 undertakings over 55,000 cookers and 237,000 fires were in use at March, 1927. The amount of electricity used in connection with cookers varies considerably. Taking 1,500 kWh per annum as being the average figure, 55,000 cookers represent a consumption of 82 million units per annum, which, if the average price is 1d. per unit, will bring in a revenue of £340,000 per annum. While this figure appears to be substantial, it must be pointed out that 55,000 cookers in the areas indicated means that only 6 per cent. of the consumers in the areas are using electricity for cooking purposes, and, as the average number of consumers in the areas in question only amounts to 20 per cent. of the total number of assessments, the number of cookers reported probably represents only 1.2 per cent. of the houses in the area. In Norwich 43 per cent. of the houses are wired, and 8.65 per cent. of the consumers, or 3.8 per cent. of the houses in the area, have cookers. There are, therefore, in that town, three times the number of cookers that are to be found on the average in the undertakings that have sent in reports. Not only are these figures good, but Norwich is continuing to progress quite as fast as other areas, as while the average rate of increase in domestic and lighting connections was, during 1927, 6 per cent. of the assessments in the area, Norwich added 10 per cent. of the houses in the area.

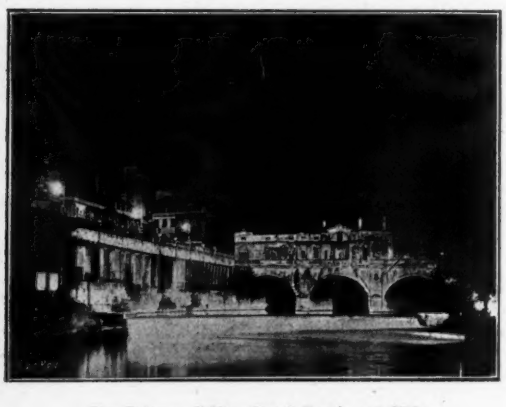
There is at present a big demand for refrigerators for trade purposes, and the demand for small domestic refrigerators is growing rapidly. The use of electricity for water heating is becoming increasingly popular, and there will undoubtedly be great developments in the near future. The electric wash boiler is used largely in many districts; it is very reliable, costs little to run, while the 150 to 400 units used per annum are a welcome addition to the energy supplied to the small house using electricity only for lighting. Water heating by means of local self-contained heat-insulated tanks, or by means of immersion heaters introduced into the hot-water cylinder of the ordinary house supply, has come to stay, as the public is willing to pay a little extra for the convenience and reliability of hot water on this system, especially during the summer months. The heating of rooms by means of electric radiators will always be popular, for occasional use, but while the radiator is used intermittently, or as an auxiliary, it will undoubtedly bring about a "seasonal" peak which has to be provided for and must be taken into account in fixing the price. It is thought, however, by some engineers that if the price is sufficiently low, electricity will be adopted in many houses and other premises as the sole means of heating, that it will then become an all-day load, and that the seasonal peak will disappear.

If the supply of electricity for domestic purposes is to be developed to the greatest possible extent it is necessary to give some assistance in the wiring of houses. Development proceeds apace in most towns, and nearly 100 per cent. of new houses are wired for electricity supply if such is available, but there remains a large number of old houses, usually rented, where it is difficult to secure the introduction of electricity.

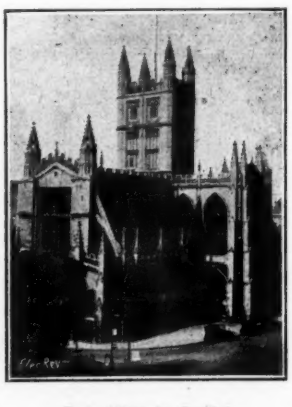
With the provision of electricity at a reasonable price, and with the apparatus on hire, the real work of selling is not ended, but is, in fact, only beginning. First the demand for electricity must be created, and the basis of this work must be publicity and propaganda, demonstrations, showrooms, exhibitions, the personal work of the sales staff, and so on. In the endeavour to create this demand special attention should be paid to new houses and new areas where houses are being built, and to young married people setting up housekeeping for the first time. In any publicity campaign that may be undertaken, or in propaganda work generally, the question of schools should be considered, and it will be found that elementary, secondary and high schools are all willing to accept in various ways educational propaganda. One fundamental point must be kept in mind—that it is difficult, if not impossible, to get the average person to enter a shop or showroom unless he has some definite requirement in his mind which he thinks can be dealt with on the premises he is visiting. Publicity should be designed, therefore, to tell the public what the showroom is and the service that can be given therein.

Under modern conditions, a great deal of effective propaganda work can be carried out on national lines for the benefit of the whole industry. The propaganda issued by the E.D.A. is directed towards increasing the sale of electricity generally throughout the country, and should be developed very largely, but it is necessarily restricted to what is possible with the revenue that is received. At present this amounts to some £30,000 in a normal year, of which £20,000 is provided by the supply undertakings. The capital invested in the electricity supply undertakings is at the present time about £300,000,000, and the £20 000 that is subscribed for national propaganda purposes cannot, it is suggested, be said to be sufficient.

The work of the E.D.A. will continue to be directed by the Council, which is elected by those subscribing the funds, but area sub-committees are being established in six provincial areas; these will be representative of the membership in the areas in question. It is proposed to consider the establishment in each area of an E.D.A. service bureau which, in addition to other work, should include the work that is carried out at present by the existing electric lighting service bureaux in Glasgow, Newcastle and Manchester. A paid officer, with such assistants as may be required, will be appointed in each



The Pulteney Bridge, Grand Parade and Weir.



Bath Abbey by Daylight.

The Abbey Tower, Floodlighted.

Electrical Illuminations at Bath during the Convention (G.E.C. Projectors).

area to carry out the work of the E.D.A. in the district under the direction of the area committee. Circles will be formed in each town, or in the areas of supply of large undertakings, each comprising in its membership representatives of the supply undertakings, wholesalers, contractors and manufacturers, and provision is to be made for the representation of these circles on the area committee.

The idea underlying the scheme of organisation is that by means of area committees and officers, more personal attention and service will be given by the Association to the whole industry, and it is hoped that in this way interest will be maintained, membership will increase, and that revenue from such membership will increase also.

Domestic Electrification: Development and Selling.

Joint Discussion on Papers by MESSRS. J. L. CARR AND J. D. PEATTIE, AND COL. W. A. VIGNOLES, D.S.O.

Mrs. H. C. LAMB (Manchester), commenting on the need for installation work to be as nearly perfect as possible, said she had been into the houses of engineers where the work was carried out with a total disregard for the wiring regulations. Flexibles were attached to wooden beams with metal staples, and the wires were run across carpets in all directions; indeed, a fire occurred in the house of one very eminent engineer from such a cause. There was great need to make electrical apparatus absolutely safe, otherwise it would be difficult to induce domestic servants to use it. Mrs. Lamb also emphasised the need for providing plenty of outlets for the use of electricity for all purposes.

Mrs. LAKE, president of the Cheltenham Branch of the Electrical Association for Women, spoke of the development of the E.A.W. in Cheltenham and of the good work it was doing.

Mr. E. E. HOADLEY (Maidstone) said that, first of all, to develop the domestic load, there must be a suitable tariff; then the type of consumer must be studied and satisfactory hire and hire-purchase schemes devised to suit the particular circumstances. It should be remembered that most factory loads were for 5½ or 6 days per week, whereas the domestic load was a 7-day load which, properly developed, could be made to increase the output without affecting the maximum load at the station. As an instance, he mentioned the case of a man who had converted his flat to "all-electric" and consumed 6,400 units in the December quarter and 4,900 units in the March quarter. In Maidstone there were 64 all-electric houses in which all the lighting, cooking, the intermittent heating and hot-water supply were provided for electrically. He was confident that hot-water supply would form one of the biggest outlets for electricity in the next ten years. The greatest feature of all in domestic development was service. He had a special staff of men under a maintenance superintendent always available at a moment's notice to put right any defects that occurred. Everything should be done to keep the consumers satisfied, and he advised others to follow his example in instructing the staff that the customer was never wrong.

Mrs. WILLIAMS (Birmingham) spoke of the need for training the schoolgirl in the use of electrical apparatus, in view of the large number of such girls who were anxious to enter the electrical industry as demonstrators and showroom assistants. Electricity and electrical apparatus were Bond Street articles, and they must have the best qualified persons to handle them.

Mr. A. W. BLAKE (Willesden) expressed strong disapproval of two-part tariffs, which, he contended, confused the customer and lost business. A simple straight charge per unit was best.

Alderman STREIMER (Mayor of West Ham) urged the greater use of electricity by the medical profession in the interests of public health.

Alderman Mrs. HAMMER (Hackney) expressed the gratitude of the E.A.W. for being invited to take part in the discussion. The membership of her Association was now 2,000, and it must be admitted that the women had helped very considerably. Well-trained women demonstrators would be far more helpful than men to the development of domestic electrification, because they could speak to the ladies as housewives and show them how things could be done, and it was with that object in view that the E.A.W. had arranged for electrical housecraft courses at the Battersea and Chelsea Polytechnics, which, if successful, would be extended by the L.C.C. all over London.

Dr. S. Z. DE FERRANTI emphasised the point that the proper development of domestic electrification was connected with service, because apparatus needed careful watching, although this would not be necessary later on. The importance of prompt service was not sufficiently realised. Everybody in the industry must have faith in its capacity to supply all their wants. The time had arrived when every electrical engineer should live in an all-electric house. Passing to the question of standard frequency, Dr. Ferranti said that it would be advisable to make any sacrifice to secure this. Even more important, however, was a standard voltage. Again, the many varieties of tariffs were damaging from the business point of view, and what was wanted was a simple two-part tariff, with a kW charge based on any principle that might be decided upon, and then a low unit charge which would encourage the use of electricity for every purpose. It would then be found that lighting was only a small fraction of the demand. In a small all-electric house which he had at the seaside the lighting units were 9 or 10 per week, but the total consumption was 500 units per week.

Lady BROOKS (president, Birmingham Branch E.A.W.) referred to the prejudice and ignorance still encountered in regard to the uses of electricity in different parts of the country and the need for developing more scientific minds on the part of the women in order to counteract that prejudice.

Mr. JOHN CHRISTIE (Brighton) suggested that education committees should install electrical cooking apparatus in their schools for training purposes. At Brighton there was one of the finest secondary schools in the country equipped with very up-to-date electric cooking apparatus. Service was a very vital thing, and the Brighton Electricity Department laid itself out to give the same attention to faults and complaints that the Fire Brigade gave to fires.

Mrs. HOWIE (Walsall) spoke of the keenness of the women in the provinces to have electricity in their homes. This had been particularly impressed upon her from contact with parents clubs and co-operative meetings. Speaking of the advantages of service to the consumer, she remarked how necessary it was to keep in touch with the consumers to see that the apparatus was working satisfactorily.

Mr. H. ADAM (Seaham Harbour) spoke of the possible danger with rubber-sheathed cable owing to the lack of earthing possibilities in the case of small domestic appliances. A difficulty in developing the use of electricity in small houses was the high price of British-made lamps.

Mrs. W. LAWSON (Birmingham) expressed her appreciation of the fact that practically the whole meeting had been given up to the women.

The I.M.E.A. Exhibition.

MESSRS. SADIA, LTD., displayed six sizes of wall-type electric water heaters, including a new 1½-gall. size. The lagging of this small heater has been given very special attention and is actually three times the volume of the container; the result is claimed to be an unusual efficiency. The overall dimensions are: 20 in. high by 9½ in. in diameter. The heater is fitted with the makers' usual thermostat working on both a.c. and d.c., and the container is made of stout tinned copper. This exhibit also included Sadia boiling plates, table stoves, auxiliary plates, special aluminium saucepans and frying pans, temperature switches and thermostats, and so on.

The display by Messrs. ELECTRIC FIRES, LTD., included several useful examples of electric water heaters designed to meet various conditions. One, a Heatrae F.B. heater, constitutes a complete hot-water system embodying a storage chamber, ball-valve tank, expansion pipe, cold-water inlet and hot-water outlet. This is intended for connecting directly to the water main and will supply hot water to several points. There was also a 10-gall. Heatrae R.T.A. thermal-storage water heater connected with a ball-valve tank. This is intended for supplying hot water to several points. A 9-kW oil heater represented the wide range of electric oil heaters made by Messrs. ELECTRIC FIRES. The oil chamber is of welded steel plate. These heaters are made to withstand working pressures up to 200 lb. per sq. in. and for loadings up to 100 kW and more.

The outstanding feature of the exhibit by Messrs. BELLING AND CO. was a selection of three cookers—Nos. 2, 6 and 7. The first mentioned is a small cooker which was introduced about six weeks before the Convention, and already more than 140 electricity supply undertakings have ordered samples. It is complete with a grill pan and grid, rod shelf, perforated shelf and deflector plate. A cast-iron stand with a pot-rack is available if required. The overall dimensions are 18 in. by 14½ in. by 13½ in. deep, while the oven cooking space is 11½ in. by 9½ in. by 10 in. deep. The height of the cooker is 37 in. on its stand. The boiling plate is of the enclosed fireclay plug-in type, 8 in. by 8 in., with a maximum loading of 1½ kW and three-heat control. In addition to boiling and frying, it also grills or heats the oven. No. 7, the "Conventional" cooker, is an entirely new cooker which has, it is claimed, been designed on conventional lines to meet the present-day needs of central station supply engineers. It is fitted with cast-iron enclosed-type boiling rings, a separate griller, and a simmering plate. Two models of this cooker were shown.

The show by Messrs. BERRY'S ELECTRIC, LTD., consisted of some new types of Magicoal fires, electric cookers, automatic wringerless washing machines, and a model of their day and night facia sign. The sign is designed upon an entirely new principle, which does not involve the use of the ordinary silvered-mirror. The washing machine is particularly interesting, inasmuch as it does not employ the roller wringer for mangling, but a centrifugal drying action. The machine is very simple and a thorough engineering job throughout. It is designed essentially to be operated by the average housewife. As was the case at Buxton last year, Messrs. Berry's Electric, in addition to a stand at the exhibition, had a large showroom in the town.

Messrs. BULPITT & SONS, LTD., showed a full range of their cooking utensils, all fitted with immersion-type elements. A feature of the equipment shown was a thermal-storage tank, which is made in 10- and 15-gal. sizes, and is specially designed for simplicity and efficiency in operation. The inner tank is constructed of 18-gauge tinned-copper sheet, this being sufficient to stand the 30-lb. pressure test required by the

non-pressure type. Another item which was seen on this stand was a surgical instrument steriliser; this is fitted with two 1,000-W renewable-pattern immersion elements.

The apparatus shown by the BRITISH ELECTRIC TRANSFORMER CO., LTD., included two new "Tricity" cooker models, one being of small design for 2-3 persons. This cooker, No. 736, is fitted with a vitreous-enamelled hob fitted with one combined boiling ring and grill. The grilling space is 8 in. by 7 in. The oven dimensions are 13 in. by 13 in. by 10 in., and the oven interior is of the withdrawable box form. Three-heat controls are provided for the oven and boiling ring and grill. The oven door panel is white vitreous enamelled. The overall dimensions of the cooker are: height, 2 ft. 9 in.; width, 1 ft. 9 in.; and depth, 1 ft. 6 in.

Some interesting electro-medical apparatus was shown by the BRITISH QUAIN SUNLIGHT, LTD. This included the "Quain" sunlight bath, which, when it is not in use as a sun bath, can be used as an ordinary radiator. It generates, it is claimed, infra-red and ultra-violet rays of great intensity simultaneously. There is embodied a special insulated electrode holder, and a special means of using the arc resistance for therapeutic purposes. The presence of the heating coils in the bowl of the bath prevents, it is claimed, the subject getting too close to the ultra-violet rays. There are two models of the "Quain" bath, No. 1, which is designed for lighting circuits, and No. 2, for power circuits.

Of special interest on the stand of CARRON COMPANY was a new series of electric reflector fires. The reflectors are claimed to be of unique construction which enables the fires to give off the highest degree of radiant heat in proportion to the loading employed. The fires have a very pleasing appearance, whether "on" or "off" circuit, and when on load the reflection of the red-hot elements gives a pleasant glow. Carron Company also showed for the first time one of a new series of very attractive imitation coal fires, embodying, it is claimed, a unique method of obtaining a realistic flickering movement. The essential feature of the fires is that both radiant and reflected heat are obtainable. Electric cookers, irons, kettles, and so on, were also shown on this stand.

There were several objects of interest on the stand of Messrs. CREDENDA CONDUITS CO., LTD., the most important, perhaps, being samples of an entirely new series of "Creda" electric cookers embodying the latest general improvements. A feature was a circular enclosed boiling plate of a type, it is claimed, never before seen in this country. The actual heating element consists of two circular flat disks which fit into grooves turned in the face of the boiling plate, and these disks lie very slightly above the face of the plate; the cooking vessel therefore rests directly on the element, and very high efficiency is claimed to be the result. In "medium" heat the inner disk only is in circuit, and heat is therefore concentrated in the centre of the plate. The new plate is made in two loadings, 1,500 or 1,950 watts, the overall dimensions of either type being 8¾ in. The element disks can be readily removed and replaced. Another exhibit of considerable interest was a "Creda" automatic water heater, arranged for use with the Willesden utility relay (ELECTRICAL REVIEW, June 8th, 1928, p. 1023). The water heater is complete with thermostat and can be provided with a booster element and separate switch if desired, current being supplied through a power meter at ordinary rates. In the ordinary way no meter is necessary and lighting cum water heating can be quoted for at so much per week, month, or quarter, with the certain knowledge of a steady 100 per cent. load.

Messrs. ELECTROLUX, LTD., made their usual excellent show with the Electrolux cleaning and refrigerating apparatus.

The exhibit of the GENERAL ELECTRIC CO., LTD., embraced a wide variety of G.E.C. products of particular interest to the municipal engineer. Among the several new lines to be seen was a representative selection of electric light fittings and fixtures, including three types of Wembley lamps, *viz.*, the "Brighton," the "Worthing," and F.C. 6046; an extensive range of household electric appliances, including irons, kettles, warming plates and fires; vacuum cleaners; gramophone motors; and so on. Considerable attention was attracted by a new cooker specially designed to meet the requirements of small families. The internal dimensions of the oven are 12 in. high, 13 in. wide, and 12 in. deep, and all six faces are vitreous enamelled; the shelf runners are removable to facilitate cleaning. Three shelves and an oven pan are provided. The hob is fitted with 8-in. and 6-in. circular totally-enclosed hotplates, the latter having a low loading for simmering purposes. Both hotplates and the oven have three-heat control. The total loading is 4,000 W. A domestic wash boiler of a new type was also shown, which makes use of a percolator tube. It is double cased and air lagged, and has an inner container and lid of heavy-gauge tinned copper. The exterior casing is enamelled, or can be supplied if required with galvanised-iron finish. A special riveted element is incorporated with clamping studs in the bottom of the boiler, a feature which renders it proof against leakage. The boiler is loaded to 2 or 3 kW as required. In addition to the stand at the Assembly Rooms, the G.E.C. had a representative display of "Magnet" industrial cooking and heating appliances in the showrooms of the Bath corporation electricity department.

A display by the HORSTMANN GEAR CO., LTD., included a representative range of "Newbridge" time switches, including models for unit and group street lighting, two-rate meter control, interior and exterior shop lighting, and so on. There was also on view on this stand a new small 5-A time switch for street lighting.

The JACKSON ELECTRIC STOVE CO., LTD., had a comprehensive display of its products, including a range of cookers, water heaters, wash boilers, fires, and so on. A feature of the apparatus was the No. 720 boiler fire.

It is constructed of aluminium and steel with a stainless hob. The heating elements are of the plug-in pattern, and one- or two-thirds or full-heat may be switched on at will. The apparatus is portable and is provided with a heat-proof handle for carrying. The loading is 2.25 kW and the overall dimensions are 23.5 in. by 16 in. by 9.5 in. A number of the cookers were shown with all-enamelled finish and proved very attractive.

Messrs. MOORWOODS, LTD., showed a large cooker for eight to 10 persons, having a large oven, a hot closet, two enclosed radiant-type boiling plates, and an open radiant-type combined grill and boiler. A small cooker for 4-6 persons, equipped with a hot closet, one enclosed hot plate and one combined grill and boiling plate, and an intermediate size cooker with all the features of the small one, but with a much larger oven, for 6-8 persons, were also shown. Among other exhibits by this firm were a portable grill, a portable hot plate, an electric mantel register, and an assortment of electric fires.

A domestic model, No. 159, refrigerator which was shown by Messrs. MARCO REFRIGERATORS, LTD., is fitted with separate doors to the food-storage and cooling-unit compartments. The food compartment has a one-piece white enamelled steel lining with rounded corners, and the expanded-metal shelves are heavily tinned, and are easily detachable. This model has 5 cu. ft. of storage capacity and is equipped with a 1/16-h.p. motor. Another domestic model shown, No. 127, has a food-storage capacity of 7.3 cu. ft., and its motive power is supplied by a ¼-h.p. motor. The "Popular" commercial model was also shown. This has a storage capacity of 31.3 cu. ft., and is equipped with a ¼-h.p. motor.

The apparatus shown by Messrs. GEORGE NOBBS, LTD., consisted chiefly of electric water heaters of the local-storage push-system type, in cylindrical and rectangular models; pressure-type storage heaters, with and without automatic temperature control; instantaneous-type electric geysers for wash basins, sinks and baths; and a complete range of immersion heaters of from ½- to 10-kW capacities. A "Genii" "National" calorifier fitted with automatic temperature control had primary heating and secondary storage compartments to prevent excessive furring in hard water districts. An innovation in this apparatus is the hot-water circulation channel which induces a more rapid circulation within the storage to the top of the cylinder. The immersion heater and the thermostat are fixed horizontally, thereby obviating the stresses and strains that are set up in the vertically fixed apparatus. Messrs. Nobbs also exhibited a complete new range of their British made thermostats.

A novel feature on the stand of Messrs. REVO ELECTRIC CO., LTD., was the Revo "Superspeed" boiling plate. By means of a transformer a low voltage is applied to the plate, which takes the form of a comparatively small, specially shaped refractory carrying a resistor of very-heavy-section nickel chromium. Extremely rapid boiling is claimed for small quantities of liquid. The element is practically indestructible, being immune from "shorts" or "earths" owing to the low voltage. The natural oxide of the resistor permits the utensil to come into actual contact with it without detriment to the element. A complete range of "Revo" cookers was also shown. New models included the "Villa" cooker, evolved especially for use in flats and on housing schemes, and the "New Bungalow." The latter cooker has just been completely redesigned, and presents many features of interest.

Messrs. YOUNG, OSMOND & YOUNG had a display of their "Unity" low-temperature tubular electric heaters and appliances. The "Unity" tubular heaters are now fitted with a patent junction box of robust design in place of the familiar ceiling-rose type of connection. A special feature of this class of apparatus is a heater for traction work, available for pressures up to 600 volts; there is an alternative design available, suitable for pressures up to 1,500 volts.

The exhibit of the ELECTRIC LAMP MANUFACTURERS' ASSOCIATION OF GREAT BRITAIN, LTD., comprised a number of panels finished in grey and orange, in which were fixed miniature interiors representing the office, the factory, the home, and so on. Each of these miniature interiors was equipped and furnished to scale, and contained all the latest devices suitable to the various interiors. Both the "old way" and the "new way" of lighting were shown and controlled by an automatic switch. The background, which incorporated a display of standard electric lamps, was very striking in character. This was finished in silver and red which, when floodlighted from behind the cubist display pylons, produced a remarkably attractive background.

The BRITISH THOMSON-HOUSTON CO., LTD., had a special display of its products in premises opposite the Pump Room. Shop-window lighting was made an outstanding feature, and two demonstration shop windows were suitably equipped with installations of X-ray reflectors fitted with Mazda gasfilled lamps. In addition, B.T.H. shop-window floodlights and spotlights were employed to give extra prominence to items of particular interest. The fittings for the home also made a special feature, and included types and designs of B.T.H. pendant fittings and brackets and table standards, together with an excellent selection of glassware and silk and parchment shades, suitable for every room in the house. For commercial and industrial lighting, ranges of Mazdalux reflectors, and Mirolux troughs and floodlight projectors were shown.

MESSRS. J. H. TUCKER & CO., LTD., showed a selection of their tumbler switches, wall plugs, lampholders, and other wiring accessories, including the latest designs in switchplates. Ironclad switches and fuses, cooker-control units, and service "splitters" were also shown. Demonstrations of the tumbler switches actually on test—electrically and mechanically—under load were also given.

Included in some interesting items seen on the stand of MESSRS. VENNER TIME SWITCHES, LTD., was a model of a new small motor with gearless speed-reduction mechanism; pneumatic apparatus for automatic and centralised controls on pulverised-fuel feed-pipe lines; an enlarged model of a solar device controlling time switches to adhere to specified sunset and sunrise curves; thermostats of simplified design, of various sizes working on small temperature changes; the Venner C. & S. electrically operated remote water level indicator; and automatic electrically wound time-switch clocks (ELECTRICAL REVIEW, October 14th, 1927, p. 651). For the actuating principle of the Venner thermostat advantage is taken of the difference between the expansion of a brass tube and the practically constant length of an invar steel rod contained within it. This difference is considerably magnified by means of a simple lever system giving ample movement to actuate the mercury tube switch.

The outstanding feature of the exhibits by the EDISON SWAN ELECTRIC CO., LTD., was the "Ediswan" prepayment meter. This is claimed to be one of the smallest, if not the smallest, prepayment meters at present on the market. An interesting point is that the standard Sangamo-Ediswan type H meter is used in conjunction with the prepayment attachments, the type H single-phase meter being of considerable size. The weight of the meter is from 15¼ to 16 lb. It has a quick, simple and positive price-changing provision. The additional friction on the meter at 1/20th of the rated full-load current is practically negligible, owing to the ingenious method in which the prepayment attachment operates through the meter.

An interesting item shown by Messrs. DRAKE & GORHAM WHOLESALE, LTD., was the "Metesco" e.h.p. oil switch which they have just developed in conjunction with the METROPOLITAN ELECTRIC SUPPLY CO., LTD. The unit consists essentially of a cast-iron box case for wall fixing, divided into three main compartments and separated by divisions cast into the box. Two chambers are reserved for the incoming and outgoing terminals respectively, and the centre chamber for the operating mechanism and venting arrangements. Attached to the main operating arm are two down rods; at the lower end of each is fitted the moving portion of the switch contacts, consisting of a steel rod and bakelite construction of rigid design which in turn carries removable fuse cartridges. The moving portion of the switch is spring loaded, providing a very rapid break. A cast-iron lid is fitted to the box with provision for sealing.

Included in a variety of electric cookers shown by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., were two entirely new models, one suitable for four persons and one suitable for four to six persons. The ovens of these models are fitted with removable oven interiors, having rounded corners and round wire shelf runners for ease in cleaning. They are fitted with side swinging doors, having white porcelain enamelled panels on the exterior. The hobs carry circular-type, fully protected enclosed boiling plates, a separate grill element with three-heat control, while a grill chamber is fitted with a fall-down door, thereby utilising this space for plate warming. Another feature of the exhibits on this stand was two-section cast-in boiling plates designed for fitting into Hotpoint-Falco electric cookers. These are 8 in. square and embody "Calrod" cast-in heating units, and are fitted with earthing terminals actually cast in the plates.

The Institution of Civil Engineers.—V.

Celebration of Charter Centenary, and Engineering Conference.

Tidal Power, and Turbines Suitable for its Utilisation.

(Abstract.)

By Professor ARNOLD HARTLEY GIBSON, D.Sc., M.Inst.C.E.

THE possibility that tidal power developments on a large scale may become economically feasible in the near future renders it desirable that more detailed and accurate data should be available. One of the most important problems is that of storage, and it has been proposed to utilise the energy at times when this is in excess of the demand to: operate a system of thermal-storage tanks working in conjunction with low-pressure steam turbines; compress air to be stored in suitable air chambers for use with reciprocating engines or turbines; produce electrolytic hydrogen for use in internal-combustion engines; and to pump water into an elevated reservoir, from which it may be taken to operate a series of secondary turbines as required. So far, the last of these systems would appear to offer most promise, where the configuration of the ground is such as to give an elevated reservoir site within a reasonable distance of the tidal barrage, but reliable data concerning the probable cost of other systems when operated on such a scale as to be capable of storing, say, from 10 to 20 million h.p.-hours of energy, would be of great value in enabling a final decision to be made.

It is possible that certain electrochemical processes might be so operated as to enable the output from a tidal station to be absorbed as and when generated, sufficient energy being obtained from existing steam stations to keep the furnaces hot when tidal energy is not available. There is also the possibility that it might be practicable to operate without storage, delivering all the energy into a ring transmission line also fed by a number of large steam stations which would be operated in conjunction with the tidal station. These possibilities are worthy of serious consideraton, in view of the fact that if the necessity for storage can be eliminated the cost per unit of output of a tidal-power installation will be little more than one-third of its cost with storage.

Such data as are available would appear to show that it is possible, with an efficient setting, to install turbines of about 10 ft. in diameter which will develop about 60 b.h.p. per linear foot of barrage under a head of 14 ft. If it were possible to increase this figure to 100 b.h.p. per linear foot it would probably be of considerable advantage. The bigger the turbine the wider are the possibilities in this direction. On the other hand, the bigger the turbine the greater is the necessary depth of the setting, and the higher the cost per linear foot of the barrage. The best size will obviously be a compromise and will depend largely upon the physical characteristics of the particular site.

While the advantages of alternating current are obvious, d.c. generators would enable the turbines to be operated at the speed appropriate at any instant to the variable head, and so under conditions of high hydraulic efficiency. The voltage of the dynamos would need to be kept constant by a system of shunt-regulation, and rotary convertors would be required to convert the energy to alternating current at a suitable periodicity and voltage.

Discussion.

Commander H. P. WARBURG, R.N., discussing the effect of a barrage on the tides and streams of an estuary, with special reference to the published plans of the proposed Severn barrage, said that the tide in the Severn attained its greatest range, but not its greatest height, at about the site of the proposed barrage, and for reasons dependent on that he urged that detailed examination of all the circumstances was necessary before any work of a nature likely to cause appreciable changes in the tides or streams was undertaken.

Mr. P. SHISHKOFF (Hallewell's, Ltd.) advocated thermal storage as applied to hydro-electric installations. The main attractive feature of a hydro-electric plant with thermal-storage was the low cost of the thermal elements, and it could be claimed that no other method existed which required such a small capital expenditure for the production of electrical energy. That was mainly due to the extreme simplicity of generating heat directly from a water turbine by means of a well-known type of brake. Brakes had been built to large dimensions, *e.g.*, 15,000 h.p. at 105 r.p.m., the cost being from £2,000 to £2,500, or only a few shillings per h.p. absorbed. The other component of the system was the thermal storage which had been developed considerably in the last few years, due to Dr. Ruths. Whilst its application in conjunction with the mechanical generation of heat and the regeneration of electric power from an hydraulic source was novel, it had been applied to power stations, and the results of considerable experience indicated that a practical figure of 18 lb. for steam consumption per kW-hour could be obtained.

Mr. P. SEEWER (English Electric Co., Ltd.) said that with an average head of 14 ft. and a maximum of 22 ft. 5 in. around the South-West coast of England and Wales, it would be necessary to build a turbine of enormous dimensions to concentrate an average output of, say, 10,000 h.p. on one shaft or unit. The only suitable and scientific design was that devised by Kaplan. The generator would have to be coupled directly and rigidly with the turbine, and would, of course, also attain very considerable dimensions. Whilst the weight of the turbine would be in the neighbourhood of 450 tons, the weight of the generator would probably exceed 700 tons. However, the propeller type of turbine permitted a certain standardisation, and if this could be extended to the electrical machinery, it would prove of considerable advantage..

Mr. ERIC CREWDSON (Messrs. Gilbert Gilkes & Co., Ltd.) suggested that there would be little advantage with the Kaplan type of turbine, as compared with the fixed-propeller type, in tidal waters, where a large number of units would have to be installed in any case. Moreover, if the best advantage was to be obtained from the Kaplan turbine, there must

be simultaneous movement of the runner and guide vanes. There were possibilities in thermal storage, but he thought there would be advantages by using a simpler type of brake than the Heenan & Froude brake which had been referred to. He had in mind some kind of electric brake such as was used for winding gear up to, say, 1,000 h.p.

Captain H. von Heidenstam (delegate of the Swedish Engineers' and Architects' Association) said that while the cost of the solution in Prof. Gibson's paper, *viz.*, to pump water into an elevated reservoir from which it could be taken to operate a series of secondary turbines, would mean a sum of about £4,000,000 for the Severn scheme, the cost of a scheme for operating a system of thermal-storage tanks working in conjunction with low-pressure steam turbines would be from £10,000,000 to £12,000,000. Further, a rough estimate of the cost of a combined steam accumulator and steam power plant showed that it could hardly be a competitor to a hydraulic storage plant. Perhaps, however, the best solution would be a combination of hydraulic storage, steam accumulators, and auxiliary steam plant.

Mr. J. Williamson said that a marked feature of the development of modern hydro-electric engineering was the construction of dams to impound and store enormous volumes of water for the purpose of furnishing a regulated supply to power stations. In general, however, the points to be considered in a hydro-electric dam were the same as arose in the case of dams for the storage of water for public supply, irrigation or other purposes.

General Mitchell (Toronto University) said that engineers in Canada were looking with considerable interest to the Severn scheme. He was a member of a Commission of engineers of the United States and Canada which was going into the St. Lawrence River scheme, and he did not think a start on the work was far off. The object was to devise a scheme whereby vessels drawing 25 ft. of water, and of about 6,000 or 8,000 tons, could be navigated along the river, and at the same time to utilise the water for power production. The estimates showed the possibility of 5 million h.p. being available, of which four-fifths was in Canada and the remaining one-fifth in America. There would be a plant in Canada and another in America, having a total capacity of 2,200,000 h.p., and it was contemplated using turbines of 55,000 h.p. working under a head of 85 ft., with water passages sufficient to take about 6,000 cu. ft. of water per second.

The General Trend of Modern Development in Steam-turbine Practice.

(*Abstract.*)

By Henry Lewis Guy, A.M.Inst.C.E.

Of the tendencies affecting the thermal efficiency of steam plant perhaps the most evident is the pronounced movement towards higher steam pressures. The motive lies in the thermal advantages offered, which are set out in Table I for the conditions there stated. The Table also holds for a total temperature of 900 deg. F. if the gains per 100 lb. per sq. in. above 700 deg. F. are increased by 0.17 per cent. With a 28-in. vacuum the gain is increased by 0.25 per cent. per 100 lb. per sq. in. increase in pressure. The "law of diminishing returns" holds in a very marked manner. On theoretical grounds reheating to the initial temperature might be expected to increase the gain by 0.125 per cent. per 100 lb. per sq. in. increase in pressure. Experience raises doubts, however, whether this increased gain will materialise.

Table I.—Increase in Steam-Pressure Corresponding to 3 per cent. Steps in Thermal Efficiency.

Increase in thermal efficiency: per cent.	3	6	9	12	15
Initial pressure: lb. per sq. in.	Final pressure: lb. per sq. in.				
From 200 to	265	365	505	764	1,360
„ 250 „	342	472	703	1,200	—
„ 350 „	495	755	1,390	—	—
„ 500 „	785	1,530	—	—	—
„ 750 „	1,470	—	—	—	—
„ 1,400 „	—	—	—	—	—
Reduction in coal consumption: per cent.	2.92	5.66	8.26	10.71	13.04

700° F. total temperature; 29 in. vacuum; four-stage feed-heating. Including boiler and condenser auxiliaries. Capacity, at maximum continuous rating, not less than: 40,000 kW at 1,500 r.p.m., 20,000 kW at 3,000 r.p.m., and 10,000 kW at 6,000 r p.m.

The expedient of installing high-pressure boilers where a considerably lower pressure is already established is attracting attention. This high-pressure steam is preferably expanded in a separate back-pressure unit and returned to the new boilers for reheating to something like the initial temperature, before admission to the older steam-mains. With initial and reheated steam temperatures of 750 deg. F. and a higher steam pressure of 1,200 lb. per sq. in., the back-pressure unit will generate 3,450 kW for each 10,000 kW generated by the low-pressure plant working at 200 lb. per sq. in., or 2,350 kW if the lower pressure is 250 lb. per sq. in.

Reheating by transfer of heat from steam to steam is also attracting attention, but such a reheating system would only be employed therefore on the doubtful assumption that steam could be generated at a higher temperature than can be used in steam turbines of present design and construction. In spite of the 5 to 6 per cent. thermal improvement obtainable, there is now a decided tendency against reheating by flue-gases, at least for pressures below 800 lb. per sq. in. The additional apparatus is large and costly, as is also that necessary to safeguard the turbine when load is suddenly dropped.

Table II gives the temperature increases which increase the thermal efficiency by steps of 3 per cent. Comparison with Table I shows that an increase of 408 lb. per sq. in. from 350 to 758 lb. per sq. in. gives the same thermal gain as an increase of total temperature of 145 deg. F. from 700 deg. F. to 845 deg. F. Designers have begun to think of strengths of materials in terms of temperature, time, and the chemical action of the medium with which they are in contact.

Regenerative feed-heating has become firmly established. In this country, where it was initiated, temperatures at the outlets of feed heaters are being generally raised, and consequently the number of stages is increasing. This is resulting in the addition of air-heaters and the retention of the economiser. The introduction of feed heaters, evaporators, and ejectors introduced a dilemma in the contract definition of performance and tests, but this is being overcome as experience is gained. It is, however, desirable to give guarantees and to take contract tests with the evaporator cut out or by-passed. For like causes, there is a tendency to seek new methods of stating performance. The possible systems are, for given steam conditions, vacuum, and stated feed temperature, by (*a*) steam-consumption, (*b*) heat-consumption, and (*c*) thermal efficiency.

Table II.—Increase in Total Temperature Corresponding to 3 per cent. Steps in Thermal Efficiency.

Increase in thermal efficiency: per cent.	3	6	9	12
Initial pressure: lb. per sq. in.	Increase in temperature: deg. F.			
200	72	143	215	290
250	73	146	219	292
350	74	148	222	—
500	75	150	—	—
750	73	—	—	—
1,400	63	—	—	—
Reduction in coal consumption, per cent.	2.92	5.66	8.26	10.71

700° F. total temperature; 29 in. vacuum; four-stage feed-heating. Including boiler and condenser auxiliaries. Capacity, at maximum continuous rating, not less than: 40,000 kW at 1,500 r.p.m., 20,000 kW at 3,000 r.p.m., and 10,000 kW at 6,000 r.p.m.

After some years' experience with the system of maximum continuous rating, there is some tendency to return to the system in which the economic rating coincided with the maximum continuous rating, but a much higher rating could be carried for a short period. Unfortunately, there is little tendency towards standardisation in capacity of plant. With interconnection of systems and centralisation of control, the necessity for a multitudinous diversity in capacity must surely disappear. The cost of developing a particular size of unit is very considerable, and the indefinite multiplication of such charges represents a serious loss. Great advantages would accrue if it could be agreed that one of the following ratings should be standardised for two years for extensions: (1) For intermediate stations 20,000, 25,000 or 30,000 kW (M.C.R.), at 3,000 r.p.m., and (2) for the largest stations, 50,000 or 60,000 kW or larger, at 1,500 r.p.m.

Discussion.

Mr. F. Hodgkinson (Westinghouse Co. of America) said that any system of standardisation whose ultimate purpose was the production of an abundance of cheap energy was much to be sought after. In the United States they had not experienced the diversities of pressure that Mr. Guy had referred to. Boiler pressures of 600 and 1,200 lb. had been used, and these might be regarded as standards. Reduction in cost was going to be secured by manufacturers concentrating on one capacity at each of the synchronous speeds for a standard frequency. Progress in steam turbines had been rapid, and in the United States, at least, new designs had been undertaken by most manufacturers almost before the prior one had been well tried, and certainly before its minor defects had all been corrected. It was this fact, he believed, more than any other, that had unnecessarily reduced the reliability factor in what was inherently a most reliable type of prime mover, besides incurring high development costs, which must in the end be borne by the ultimate consumer. The present advance in power plant economics by the employment of higher pressures was an obvious one, but the amount of pressure was distinctly limited by the rapidly increasing cost of boilers, the economical pressure depending on that, load factor, fuel cost, and so on.

Mr. F. Samuelson said he understood that, under the new Electricity Act, producers of electricity were allowed only a very moderate dividend: that being the case, it seemed that the incentive to use higher-efficiency plant had disappeared. He hoped the Electricity Commissioners would support Mr. Guy's suggestion that some plant, experimental perhaps to some extent, should be built, and that the purchasers should share with the makers the burden of the cost of development, which ultimately became of national advantage. There were no unforeseen difficulties in the use of higher steam pressures that they need be afraid of; it was a matter entirely of cost. With regard to higher temperatures, however, the question of materials had to be considered, but he was satisfied that the metallurgists and steel makers had already produced new alloys at reasonable cost which would permit raising the steam

temperature another 150 or 200 deg. above what we had been used to in the last few years, and he believed it would be cheaper to obtain the extra 6 per cent. in efficiency by raising the temperature rather than by raising the pressure.

Mr. H. H. MARTIN said that when in Switzerland last year he was told at a certain works that the steam temperature in a turbine rose to 570 deg. C., although the makers had not contemplated that a temperature of 450 deg. C. should ever be exceeded; when the turbine was opened up, it was found to be in perfect order. He was not disposed to accept the view that creep was always present, although he believed it was true that after the lamination of metal a little time was required for it to settle down to a steady state. A matter which had been very striking of late years was the remarkable increase in the efficiency of impulse bearing.

Mr. K. BEAUMAN said that the increased cost of the plant was due largely to the increased cost of the boilers. It was to be hoped, therefore, that the future efforts of the boiler-makers would bring about a still more accelerated rate of reduction of the increase in the total cost of the plant, and thus pave the way for the more rapid development of power stations in this country. As to Mr. Guy's statement that on a pressure of about 1,000 lb. per sq. in. the disadvantages of flue-gas reheating were minimised, he agreed that this applied in connection with plants such as were at present in successful operation, with steam from the back-pressure turbine discharged into the low-pressure main, which was also fitted with low-pressure pumps, acting as a kind of accumulator and taking the variation in load.

Mr. W. H. PATCHELL supported Mr. Guy's advocacy of standardisation, not only of sizes, but of steam pressures, for there were too many steam presures and sizes on the market. He supposed the users would not get the designers to agree as to whether they (the users) were to do the best with one, two or three cylinders, but if the designers would give an over-all efficiency and standard sizes, let them go about it, and God-speed to them. Referring to the problem of heat rate, he said that that brought up the very important question of steam tables; until they got international agreement as to steam tables he suggested that they would not be able fairly to compare heat rates.

Mr. S. B. DONKIN agreed with the suggestion as to the limitation of pressure for different sizes of plant, though the figures given in the paper were probably open to argument. With regard to the new methods of stating performances, he thought they might have some value where the manufacturer was putting down both the turbine alternator and the condensing plant; he wanted the maker to give a guarantee of the quantity of steam to the set per net output per hour.

Mr. I. V. ROBINSON said it had been suggested that the correct way of arriving at standardised capacity of a turbine was upon the area of the last row of blades—the last annulus area. Following that line of thought, it appeared to him that one should specify that the rate of a certain run as determined by the last row of blades was so many kW to a vacuum of 29 in. He considered that heat consumption was the right solution of the performance problem.

Dr. JOHN W. LIEB said that in the United States there were 11 stations using steam at pressures above 500 lb., and there were more under construction. There were two 1,200-1,400-lb. stations (Edgar and Lake City) which had been running from one to two years, and three others, Deep, Hammond and Kansas City, where very high pressures were now under consideration. The operating experience with those high-pressure stations had been quite satisfactory. There were a number of plants in the United States which were giving good economies—single stations with good load factors. Quite a few of them were running at less than 1 lb. of good coal per kWh.

Mr. R. W. BAILEY agreed that information which had become available recently with regard to the endurance of materials, justified the view that they could employ higher temperatures, provided compensation was made for that increase in temperature by altering the pressure.

Mr. W. SELVEY emphasised the importance of pushing the conditions of the experimental machine far beyond the limit which it was afterwards proposed to apply for everyday practice. He hoped some method of experimenting might be developed which would be cheaper than that of making large turbines and testing them.

Mr. LE PAGE (American Society of Mechanical Engineers' Research Committee) said that for about eight years the Research Committee had been developing the material from which steam tables were eventually to come. The reasons for the organisation of the Committee were the increased pressures and temperatures, and the lack of authentic information on the properties of steam in those ranges. The steam tables were intended to be the A.S.M.E. steam tables, but the A.S.M.E. welcomed the suggestion that it should co-operate in the work of developing an international table.

Mr. GUY, replying to the discussion, said that the great advantage which had been obtained in America from standardising the steam pressure which should be adopted for the main bulk of production units of comparatively large size had been entirely overlooked in this country. Another point which was not appreciated was that the pressure which had been adopted for that purpose was not the 1,200 to 1,300 lb. about which one heard so much, or even 500 to 600, but only 400 lb. at the boiler. With regard to the question of what the ratio should be between maximum possible capacity and so-called economic capacity, in some countries the requirement was being met by the installation of big-load sets, of relatively small initial cost and low efficiency, which were intended to work for perhaps two hours a day. That kind of plant certainly deserved consideration, and there was certainly a growing field for it. It was satisfactory to think that a working basis of agreement for international steam tables had already been arrived at. With regard to the pressure required for a particular size of unit, the sizes in the paper were mentioned with a view to drawing the opinions of other people. They might be reduced to one-half if it were possible to run the high-pressure part of the machine at the speeds which were commonly associated with the periodicities mentioned.

Heavy Internal-combustion Engines.

(Abstract.)

By GEOFFREY PORTER, Assoc.M.Inst.C.E.

Broadly speaking, oil-engine practice has followed two distinct, but converging, avenues of development which have led to the evolution of the surface-ignition engine and the high-compression or Diesel engine. Limitations imposed by ordinary materials, the processes adopted for the preparation and combustion of the working fluid, and the restraining influence upon design exercised by the essential objectives of the type, namely, extreme simplicity and low first cost, restrict the construction of the true surface-ignition engine, in the "hot-bulb" form, to units of moderate power. When low first cost is more important than high efficiency, and when the class of labour employed and the conditions of service are rough, this type of engine is very serviceable.

To what extent the retention of the term "Diesel" in relation to high-compression engines is justified, other than for commercial reasons, is a matter of controversy. The only one of Dr. Diesel's original principles remaining in modern practice is that which requires the spontaneous combustion of the *first* charge solely by means of the heat generated during the compression of air induced before mixture and ignition. The constant-pressure cycle has been abandoned in favour of the more economical dual cycle, which permits increase of pressure during the admission and firing of the charge. Fuel is not actually injected into a compressed charge of clean air. In four-stroke and two-stroke engines, respectively, the oxygen-content of the mixture is about 96 and 93 per cent. of that which would obtain if perfect scavenging were effected. The respective advantages of the two-stroke and four-stroke cycles are still a matter of much controversy, but at the present time there is little to choose between them in such important considerations as fuel-economy, thermodynamic efficiency, mechanical efficiency, cost of repairs, and reliability. The weight of a two-stroke engine, even of the single-acting type, per effective horse-power, and the simplicity of its parts give it a distinct advantage over the four-stroke engine. In examples of air-injection engines the power absorbed by the air-compressor is about the same for both types, namely, 8 to 10 per cent. at full power. The losses inevitable in the two-stroke engine due to the incomplete utilisation of the cylinder-volume and the power absorbed in the scavening-pump are about equal to the losses in the four-stroke engine caused by back-pressure on the piston during the exhaust- and induction-strokes and the frictional losses due to inertia. As may be expected, it follows that the thermodynamic efficiencies are almost identical.

At the present time the only existing or projected units large enough for use as main units in capital power stations are the steam turbine and the high-pressure boiler. It seems clear that future development will proceed along the lines of high rotational and piston speeds, and that high mean brake pressures will be one of the principal objectives. The materials available for construction are the chief obstacle, but the skill of the metallurgist will overcome this restriction. With a metal possessing the strength of nickel-steel and the refractory properties of fire-brick there would be little to prevent the construction of a compound high-compression engine. On the subject of operating cost, it may be said that no prime mover can compete with the high-compression engine in terms of commercial efficiency, unless the price of coal is very low and local conditions favour some other type. It is quite evident at the present time that a centralised supply of electrical power cannot easily compete in terms of cost with the locally situated high-compression internal-combustion engine.

The remarkable characteristics of the heavy-oil engine adapt it admirably to the service of a centralised system for the supply of electrical energy and merit its careful consideration as a vital factor therein. International experience shows that 50 per cent. of the generating plant provided produces no more than 5 per cent. of the total electrical output. By means of a suitable combination of turbo-generators and heavy-oil engines on an extensive scale the annual cost of generation by steam alone can be reduced by a substantial amount; a recent calculation suggested an economy of the order of 9 per cent.

Discussion.

Professor C. J. HAWKES suggested that it was time they dropped the name "Diesel" in connection with the airless-injection engine, and gave a little credit to an English engi-

neer, Ackroyd Stewart. It seemed to him that many people did not appreciate the stresses likely to be set up due to the transference of heat from the working fluid to the cooling medium. The author's figure of 25,000 B.th.u. per sq. ft. of surface per hour as being a usual rate of maximum heat flow seemed to be rather low. He also regarded the author's figures of 96 and 93 per cent. for the oxygen content in the mixtures for four-stroke and two-stroke engines, respectively, as rather high; in a four-stroke engine the figure would not be much higher than 86 or 87. A high scavenging efficiency was needed because that would reduce temperatures.

Mr. DYKES stressed the necessity for considering the Diesel engine in the future for electrical generation. For dealing with the peak load units, and in stations with poor load factors, there was nothing to touch the Diesel engine. He had put before the Central Electricity Board a definite proposal to work a station of 30,000 kW merely to take the peak load, and he was convinced that if this offer were accepted the Board could be supplied with peak-load energy much more cheaply than it could get it in any other way. He emphasised that we could not expect English makers to turn out large Diesel engines cheaply when they could get orders only at very infrequent intervals. A difficulty with the large Diesel engine was that, with its comparatively low speed, the cost of the alternator became greater, and that was an all-important matter. The makers were now directing their energies to obtaining higher speeds.

Mr. TOOKEY emphasised the importance of cooling, not only during running, but after running. Temperature after running was not acknowledged to be as important as it really was; that emphasised the importance of the education of the attendant.

Mr. F. H. LIVENS expressed the view that there was quite a future for internal-combustion-engine stations in isolated places, having in view the immense amount of capital invested in large electricity supply stations. For stations below the capacity of 150 or 200 kW the cost of labour involved in looking after internal-combustion engines was considerable, but above that size, the cost per unit generated, provided the station had a decent load factor, would be very close to what it would be for many years under the grid supply scheme. He did not think the days of the small station were numbered to anything like the extent that was often suggested.

Sir ERNEST PETTER expressed appreciation of the fact that Mr. Porter had not indulged in the conventional sneer at the two-cycle crankcase-compression engine. Considering that many thousands of engines of that type were working all over the world, and that they did not require such careful attention as the higher pressure engines, it would appear that that type of engine was justifying itself.

The Electrical Research Association.

Proposed Reorganisation, with Representation of Contributing Interests.

A CONFERENCE was recently held at the Institution of Electrical Engineers to consider the future of the E.R.A. at the expiration of the period of Government support, which is now on a diminishing scale and ceases in 1930. The Conference was presided over by Sir Richard Glazebrook, and was attended by representatives from all sections of the industry.

After the chairman had explained the purpose of the meeting and the urgent necessity for steps to be taken with the object of providing financial support for the Association, Mr. H. T. Tizard, secretary of the Department of Scientific and Industrial Research, spoke in high terms of the work of the E.R.A. during the past eight years, during which it had been receiving financial support from the Department, and outlined the Department's policy towards the various Research Associations which it had helped to bring into being. He emphasised the necessity of the industry putting its Research Association on a sound financial basis, and indicated that with an annual revenue of over forty million pounds, the electricity supply industry was in a position to support the E.R.A. to a much greater extent than it had done in the past.

Mr. W. B. WOODHOUSE and Mr. LL. B. ATKINSON (past presidents) spoke of the work already carried out and now in progress and contemplation, and Mr. C. P. Sparks urged the necessity of further support from the supply industry, but suggested that representation on the Council of the E.R.A. should be proportionate to the amount subscribed by the various interests forming the organisation.

A general discussion followed, after which the following resolution was put to the meeting and carried unanimously:—

That this Conference, representative of the principal bodies interested in electrical engineering and research, agrees to use its best endeavours to secure the financial future of the Association, and that the representatives undertake to confer with their respective bodies in order to ascertain the amounts which each might contribute towards the funds of the Association in order to secure and extend the present scale of expenditure (£25,000 per annum), and to double it within five years;

That the representatives will report the results to a Committee to be set up, which will call a further Conference, to consider the promises of support and also recommendations from the E.R.A. Council as to changes in the Articles of Association necessary to give adequate representation to the contributing interests;

That this Conference requests the following bodies each to nominate members of this Committee and to furnish, at the earliest opportunity, their names to the director of the E.R.A. at 36-38, Kingsway, W.C.2:—The British Electrical and Allied Manufacturers' Association, the Cable Makers' Association, the Electricity Commissioners, the Incorporated Municipal Electrical Association, and the Institution of Electrical Engineers (one member each); the Conference of London Electricity Supply Companies, the Incorporated Association of Electric Power Companies, and the Provincial Electricity Supply Association (two members between them).

In the course of his introductory remarks, the CHAIRMAN said that the total expenditure during the past ten years appeared to amount to something of the order of £138,000, and the benefits had gone not merely to the manufacturers, who produced better goods at less cost, but to the users. For instance, the cables research had added £4,000,000 to the value of the cables already laid, and was saving at present £250,000 every year. Turning to the experiments on turbine nozzles, in the case of a fairly large station of 100,000 kVA, there was an estimated saving of £6,000 annually, due to the results of research.

Mr. H. T. TIZARD said that the Advisory Council held the firm opinion that there was a big field open for co-operative research, which was in addition to research carried out by private firms, by universities, or by governments. Research Associations were not meant to replace other work; they were to be a necessary link in the chain of application of scientific discovery and method to the needs of the community. They were not in the least meant to replace or discourage the efforts of individual firms, and they had not done so—he knew of instances where private firms which had no research departments had set up such departments as a result of their knowledge of and association with their own research association. The Advisory Council considered research associations to be still in an experimental stage; the experiment would not be completely successful until the associations were established on a self-supporting basis, with proper financial provision, as permanent research organisations. If the electrical industry was not convinced, on the results of ten years' work, that this Association was likely to be of permanent value, how could the Department form a different opinion? The Association up to now had been very largely supported by manufacturers through their particular associations, but a number of researches undertaken by the Association, and the results obtained, were directly to the benefit of the supply industry; yet the total subscriptions paid by the supply industry to the Association were between £3,000 and £4,000—that was to say, £1 for every £10,000 of revenue. That could not be regarded as a satisfactory state of affairs. Quite apart from the support given by the Department to the Association, it was actually spending to-day, in one form or another, for general research at the National Physical Laboratory on electrical problems, something like £35,000 each year. In addition, the Government had set up a high-pressure plant at the Laboratory, mainly for the benefit of the industry of this country, at a cost of something over £50,000, and the State, through the Service departments, spent a large amount of money on electrical researches of various kinds, the results of which came back sooner or later to the industry. So he thought the State was already doing its fair share. Every one must realise how very unsettling it was for any research staff or organisation always to feel this uncertainty about the future; it was quite impossible to expect really good work to be done under such conditions, and he had been surprised at the results the research associations had achieved in the face of that financial uncertainty. He sincerely trusted that the Conference would be the start of a real effort to remove it.

Mr. W. B. WOODHOUSE, on behalf of Mr. R. P. Sloan, president of the Incorporated Association of Power Companies, said that Mr. Sloan and the Power Companies were entirely sympathetic to the work that was being done, and very anxious that it should continue on an extended scale.

Mr. LL. B. ATKINSON (past president) drew attention to the "extended steam tables on the properties of steam," which were produced by Professor Callendar, and were published by the Association; those tables gave information which was vital to the turbine industry in the present state of pressure and temperatures, and quite new methods of calculation were

opened in connection with steam-turbine design. That had put designers in this country, for the time being, ahead of those of any other country in the world. The research on steam nozzles would result in a saving, on our present production, of £250,000 a year to the supply industry. If they could raise the temperature at which they were working by 100 deg. C., they would add 5 per cent. to the efficiency. On the present output, that meant another £250,000 annually saved to this country, and the same for every 100 deg. C. that they could raise the steam temperature. The only thing that was wanting to enable them to grasp that sum was a few hundreds or thousands spent on improving materials for boilers and subsidiary plant and for turbines themselves. The thing was quite within reach if they would only take advantage of it. They were still carrying on researches in connection with details which had given trouble in the use and maintenance of cables. Those problems, when solved—as they would shortly be—would ensure an amount of safety and continuity of supply which would put our supply engineers in a state of certainty. By the switchgear researches they had already made discoveries which had uncovered quite new systems of control. They were quite revolutionary. As soon as they were adopted, hundreds of thousands of pounds yearly would be saved to the supply industry and to the manufacturers in that one section alone. That work wanted carrying on, but they had reached the limit of the apparatus at their disposal for testing such things. They were trying to make switchgear on quite a moderate and cheap scale which would easily and with absolute certainty break 100,000 kilowatts. That required a 100,000-kilowatt plant to test it with, and those things were not trifles. If they were to keep abreast of the times, they must spend money on additional and large plant for testing work. It was considered that they might well spend, in the next five years, from £100,000 to £200,000 for such plant alone. It was estimated that the supply industry and private users in this country spent every year about £1,000,000 in repairing breakdowns arising from faulty insulation. It did not need much imagination to realise the necessity for the continuation of the work on insulation and its properties, to enable them to cut out at least a quarter of that £1,000,000. That, again, would be £250,000 a year coming into the industry because they had found out something that they did not at present know, and which could be found out with quite reasonable expenditure. An expenditure of £20,000 for the next five years could be exceedingly profitably spent in getting a good deal deeper into the meaning of insulation and what lay at the basis of it, so that it could be applied to the industry. These achievements, put quite conservatively, would amount altogether to about £750,000 *a year*, whereas they had spent in seven years only about £150,000. There was no direction in the electrical industry wherein investments gave such a return. The money they had been spending—about £25,000 a year—was a pitiable sum; supposing they called it £50,000 (and that was certainly what they were aiming at), if they could spread it properly over the industry, so that everybody would bear a reasonable share of it, it would be an annual charge of 1s. 3d. on every £1,000 of capital in the electrical industry. If they put it on the annual turnover it would amount to 5s. per annum on each £1,000. He could not believe that the industry could not afford 5s. on every £1,000 that it was turning over. The real difficulty was that the people they really wanted to get at were not the people who were in touch with the work done. They had no precise means of measuring the results, and furthermore, they did not see that the results already obtained were only an earnest of what might be obtained if they could work on a much more secure basis. They were going to recommend that those who held the purse strings should get together and arrange a general principle of assessment throughout the industry, which, if it were carried out generally, would be a very small burden, but which might have a result of which they had hardly measured the beginning!

Mr. C. P. SPARKS, speaking as an individual member of the Council, with special reference to the electricity supply industry, said that it formed no part of the organisation at all; it was a body of manufacturers set up with the support of the Government. The supply industry contributed to some extent, but it was not responsible for setting up the organisation, and it was now taken to task for having played a very small part. Three years ago it was decided to form a class of associates, and he felt proud to say that out of the 624 undertakings no fewer than 144 had become associates, and were now putting up £4,100 per annum to support a body on which they had no direct representation at all. That was rather an encouraging start; practically a quarter of the undertakings had recognised the importance of the work. From the latest returns, the investment in the electricity supply industry was over £200,000,000, with a gross revenue of some £41,000,000. He suggested that it could well afford to put on one side one-tenth of 1 per cent. of its gross revenue for research, subject to one point, namely, that representation on the Council should be proportionate to the amount subscribed by the various interests forming the organisation. If any such scale were adopted, they would have a sound financial basis. In view of the financial limitations, Mr. Wedmore and his staff had obtained results out of all proportion to the funds at their disposal.

Dr. W. H. ECCLES (Institution of Electrical Engineers) said that the Institution was most anxious to see everything possible done to ensure the continuance of this Association, and it was a subscriber to the funds.

Mr. F. W. PURSE (past-president of the Incorporated Municipal Electrical Association) said his Association fully endorsed the work of the E.R.A. and was quite satisfied that it was deserving of every support. There were difficulties to be overcome in raising money from the members. Whether this end could be achieved by a compulsory levy would have to be considered. He did not think they would get the money from everybody unless it were compulsory.

Mr. T. P. WILMSHURST (Electricity Commission) said the Commissioners highly valued the work which had been done by the Association. The Commissioners, unfortunately, had no power to contribute funds by means of annual subscription to the E.R.A.; they had power under the 1919 Act to contribute towards any special piece of research, and were conducting certain specialised research through the mediumship of the E.R.A. into problems connected with the 132,000-volt lines. He could speak from experience as to the painstaking way in which that research had been carried out by the Association.

Mr. D. N. DUNLOP (director of the British Electrical and Allied Manufacturers' Association) referred to the support given by the B.E.A.M.A. to the E.R.A. during the whole of the latter's existence, and stated that his Council at a recent meeting unanimously decided to continue its support on a scale at least comparable with what it had been doing during the past eight years, and probably with additional support later if the conditions of the industry improved. He also referred to the work done on the technical Committees of the E.R.A. by the experts, technicians, and companies who were in the B.E.A.M.A., which had a considerable monetary value not appearing in the accounts. It had been suggested that the cost of research was included in the price of the plant and apparatus supplied by the manufacturers; that was hardly true, since prices were largely determined by competitive tenders from abroad. He thought that the work of the E.R.A., considered in its widest sense, was of general interest to the entire industry throughout all its branches, and should be considered as of national importance.

Mr. C. C. PATERSON (director of Research Laboratories of the General Electric Co., Ltd., at Wembley) said there were two sets of problems in connection with the electrical industry: broadly speaking, one was the problem of production and the other of utilisation. Private industrial research laboratories were mainly engaged on the problems connected with production, but there was also the other broad field of research which was not their exclusive province, and the burden should not fall solely on the manufacturers in this field of work, namely, the problems of utilisation, as exemplified by the buried-cables research and work of that nature. There was no industrial production organisation in this country which was not prepared to bear its full share of this important general research on the utilisation of electrical products. That burden should be borne equally by the whole industry. There was no clash between the work done by an industrial research laboratory and the work done by an Association such as this. The electrical industry would not flourish unless both types of problem were effectively tackled.

Lt.-Col. K. EDGCUMBE (president-designate of the Institution of Electrical Engineers) said the E.R.A. had been of very great use to the industry in raising the prestige of the members of delegations to international meetings abroad. At the I.E.C. meeting at Bellagio Mr. Wedmore and Mr. Everest were able to give first-hand information on the rating of spark gaps for extra-high voltages, and largely as the result of this, the English view-point was upheld throughout. The same thing occurred at the High Tension Conference in Paris in connection with transformer oils, where Mr. Everest did a great deal in upholding the English standpoint. The small manufacturers, although they had their own research departments, had found the Research Association extraordinarily useful.

Mr. J. T. MOULD (the Radio Manufacturers' Association) said he would suggest to his Association that it was its duty to help the E.R.A. in every way possible.

Selenium Cells.

Before the Physical Society of London, recently, Mr. Geo. P. Barnard, of the National Physical Laboratory, explained the results of some experiments on the light-sensitivity of commercial selenium cells. Part I of his paper showed that the change in conductivity C due to a given intensity of illumination I is proportional to some power of the illumination I, *i.e.*, $C \propto I^x$. The index value x varies from cell to cell, and is probably dependent on the construction of the cell; a sensitivity curve was exhibited. Some filter experiments were described in Part II, from which it appears that the change in conductivity of selenium cells is dependent, not on the number of foot-candles incident on the cell, but rather on the amount of radiant energy received. Contrary to general belief, it was shown that, for the same amount of energy received, the action of the infra-red is relatively much weaker than that of the shorter-wave portion of the spectrum. Some experiments on the decay of conductivity of selenium after exposure to radiation from various portions of the visible spectrum indicate that, throughout a large portion of the visible spectrum, the internal state of the selenium, as determined by the change in conductivity, is independent of the wave-length of the exciting radiation. A brief note on the nature of the light-action in selenium cells was added.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

Artistic Glassware Fittings.

Messrs. CAMILLE ESPIR, LTD., 19, Hanover Square, W.1, have introduced in this country a range of particularly attractive glassware electric light fittings, an example of which is shown in fig. 1. This fitting is made up with eight glass

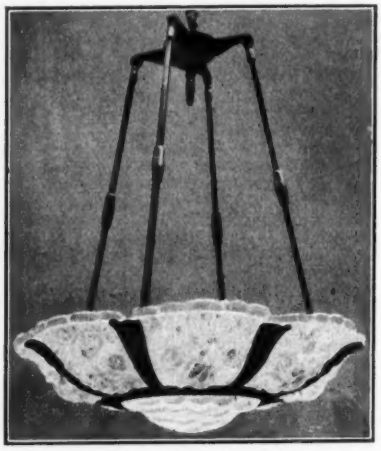


Fig. 1.—Artistic Glassware Fitting.

panels and a central bowl, all of which can, if required, be supplied separate from the framework and suspension unit. It is claimed that the fittings are supplied on a competitive basis with those of French manufacture which were responsible for creating the demand for glassware fittings of this particular style.

Oil Filter Developments.

Recent interesting developments in connection with the Stream-Line filter manufactured by the STREAM-LINE FILTER CO., LTD., 45, Horseferry Road, S.W., include a renovator unit for actual attachment to the engine whose lubricating oil it is desired to treat, and a special filter for dealing with transformer oils, which removes water as well as solid particles efficiently. It may be generally known that the principle of the Stream-Line filter involves the passage of the oil between disks of filter paper (treated according to the class of work

Fig. 2.—Construction of Filter.

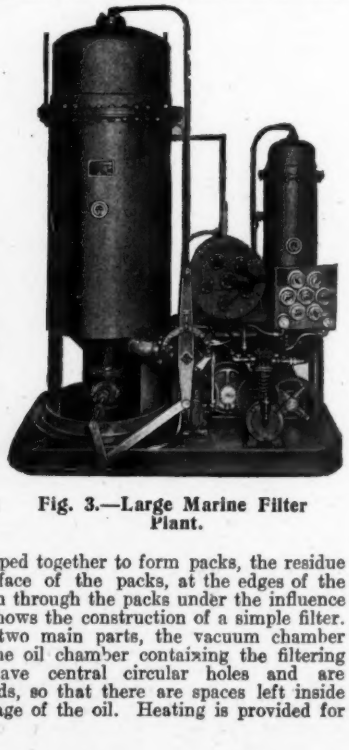


Fig. 3.—Large Marine Filter Plant.

to be carried out) clamped together to form packs, the residue collecting on the surface of the packs, at the edges of the disks. The oil is drawn through the packs under the influence of a vacuum. Fig. 2 shows the construction of a simple filter. Essentially there are two main parts, the vacuum chamber or oil receiver, and the oil chamber containing the filtering packs. The disks have central circular holes and are mounted on square rods, so that there are spaces left inside the packs for the passage of the oil. Heating is provided for the oil either by immersion heaters in the case of transformer oil, or, in the case of the attachment unit, by the exhaust from the engine. A small pump of special design provides both vacuum for operating the plant and compressed air for cleaning purposes. The sludge is removed from the packs by applying compressed air in the opposite direction to the oil flow. In the oil receiver of the transformer-oil apparatus are a number of trays over which the oil is allowed to spread out in order to evaporate off the water, the oil being heated by immersion heaters. At a demonstration in the Stream-Line Company's laboratory barium sulphate cold precipitated, which is claimed to have a finer suspension than colloidal carbon, was effectively "Stream-Line" filtered. Fig. 3 shows a large self-contained Stream-Line plant for marine service.

Two New "Sun Electrical" Products.

The SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2, has recently added a new electric washer—the ABC Spinner—to its range of such apparatus. An improved version of the familiar agitator washing principle is employed, but a departure from standard practice is the incorporation of a separate spinning drier chamber which moist-dries the clothes in less than the time taken, it is claimed, with even a motor-operated wringer. So thorough is the drying action that clothes which have been run through an ordinary wringer will yield additional water after spinning for two minutes in the drier chamber. This chamber embodies a revolving turret which locks in any position and enables suds to be returned

Fig. 4.—Electric Washer with Spinning Drier.

to the washer tub and rinse water to the rinse tub. The washer, fig. 4, is constructed of seamless Armco metal, porcelain finished inside and porcelain enamelled and painted outside. The drive mechanism is simple, and all the moving parts are enclosed.

Fig. 5 depicts another recent production of the Sun Electrical Co., an electric water boiler of improved design. The

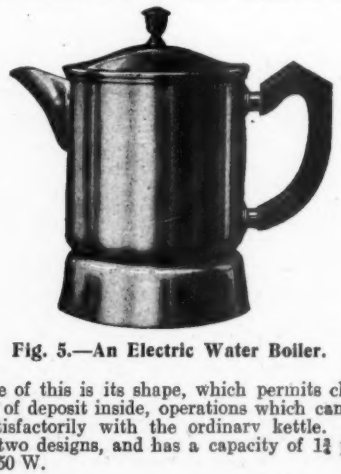


Fig. 5.—An Electric Water Boiler.

main feature of this is its shape, which permits cleaning and the removal of deposit inside, operations which cannot usually be done satisfactorily with the ordinary kettle. The boiler is made in two designs, and has a capacity of 1¼ pints and a loading of 550 W.

N.W. England Electricity Scheme.

Outline of a Scheme Prepared by the Electricity Commission and transmitted to the Central Electricity Board.

(*Concluded from page* 1131.)

As is indicated on the map below, the stations will be interconnected by 132-kV overhead ring transmission lines, 19 in number, with 8 more to operate at such voltages as may later be approved of by the Commission, comprising 384 circuit miles of line and 29 transforming stations (largest of 180,000 kVA at Barton, smallest of 5,000 kVA at Atherton). The secondary transmission system will consist of 13 lines operating at 33 kV, with 24 transforming stations (largest of 30,000 kVA, and smallest of 1,000 kVA). Incidentally, the interconnection of the stations will result, it is claimed, in the release for revenue-earning purposes of about 127,000 kW of plant now kept as spare and representing about £2,159,000 of capital.

Map of North-West England Electricity Area.

The scheme contemplates the conversion, at an estimated eventual cost of £399,500, to 50 cycles of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board's 25-cycle system, which is the only one in the area now operating at a non-standard frequency.

The cost of the scheme to the Board for the erection of the transmission system is estimated at £4,834,718. In addition, there will be an expenditure by undertakers of about £4,297,620 on the erection of two new stations and the extension of existing ones. It is estimated that the full advantages of the scheme can be secured with a saving of about £2,144,762 on capital expenditure (up to the year 1934-55), compared with the capital expenditure that would be necessary if the present system were continued; after that date the saving on capital expenditure will be progressively greater, compared with individual development. The Commission has outlined a provisional plan of working the stations, with the necessary estimates, which suggestions are, of course, tentative, since the working of the scheme, including the fixing of tariffs, is the responsibility of the Board; but, taking the figures as they stand, it is of interest to note that the Commission estimates that in the five years, 1930 to 1935, there will be a saving to the undertakers in the area of about £2,780,253, or an average of £500,000 per annum.

The progressive reduction of the average charge per kWh sold to undertakers in the area is estimated as: 0.42d. in 1930-31; 0.39d. in 1932-33; and 0.37d. in 1934-35. The progressive reduction of the annual average cost of generation is estimated as: 0.36d. in 1930-31; 0.34d. in 1932-33; and 0.32d. in 1934-35.

In preparing the scheme the Commission was confronted with special problems which were not encountered in the case of the other schemes which have been adopted: they arose from the intensive electrical development already brought about in the industrial parts of Lancashire; the existence of numerous contracts for bulk supplies made by various undertakers with the Lancashire Electric Power Co. on the one hand and with certain municipal corporations on the other hand, and the bearing of Section 12 of the Act of 1926 upon contracts made before the passing of that Act; the activities of the North Wales Power Company, Limited, as the transferee of the supply powers of the North Wales and South Cheshire Joint Electricity Authority; and the existence of considerable territory in North Wales and in the northern portion of the area of the scheme at present unprovided with electricity.

In addition to the survey made by the Commissioners, the positions of the South-East Lancashire and Mid-Lancashire Electricity Districts were separately reviewed by the Engineering Committees of the respective Advisory Boards.

The maximum load in the area at the end of 1926-27 was 582,158 kW, and is estimated to reach 1,207,573 kW at the end of 1934-35, and by the end of 1940-41 a total of 1,837,000 kW. The sale of electricity in the area during 1926-27 amounted to 1,291.76 million kWh, or an average of 185 kWh per head of population, and is estimated to reach a total of 2,996.8 million kWh in 1934-35, or of 429 kWh per head of population. The sale in 1940-41 is estimated to amount to 4,790 million kWh, representing 686 kWh per head of population.

Important electrified railway services have already been in operation for many years past in this area, supplied from generating stations owned by the companies concerned. There is every reason to expect an early expansion of these services, but no specific allowance has been made in the estimates of growth either for the transfer of the present loads to the system of the Central Board or for any further railway traction requirements in the North-Western area. The sites of the principal transforming stations and the routes of the transmission lines are so located, however, that supplies to railway companies for traction and other purposes can be readily afforded when the necessity arises.

The output from the two hydro-electric stations of the North Wales Power Co., Ltd., at Cwm Dyli and Maentwrog will be combined with the preponderating output of coal-fired plant in the area, and it has been assumed that, owing to the special conditions attaching to these installations, it will be necessary for the Central Board to come to an arrangement with their owners whereby the water-power plant may be permanently operated in conjunction with the scheme.

Copies of the scheme with map, and of the supplementary particulars with load curves, price 1s. 6d. and 3s. 6d. net, respectively, are obtainable from H.M. Stationery Office.

Legal.

British Thomson-Houston Co., Ltd., v. Bett.

A MOTION by the British Thomson-Houston Co., Ltd., against W. Bett, St. George's Square, Regent's Park, in default of appearance came before Mr. Justice Tomlin in the Chancery Division on June 26th.

Mr. TOOKEY, for the company, said that the motion was for an injunction restraining infringement of the company's leading-in wire and gasfilled lamp patents.

His LORDSHIP: I see you are asking for delivery up and an inquiry as to damages, but you are joint owners with the Marconi Company of one of the patents. Are you entitled to recover damages for your own use of the patent?

Mr. TOOKEY: Yes. It has been decided that a tenant-in-common can take proceedings individually.

His LORDSHIP: Does the infringer have to pay damages to the other owner as well?

Mr. TOOKEY: No. It will be proved at the inquiry who was damaged. Marconi's use this patent for wireless and the plaintiffs' use it for electric lamps. If they are entitled equally the plaintiffs will only get half.

His LORDSHIP granted a perpetual injunction with costs, and directed delivery up or destruction of all infringing articles and an inquiry as to damages.

Theft of Electricity.

AT Blackburn, on June 29th, James C. Henshaw, Blackburn, was fined 40s. for the fraudulent consumption of electricity. Defendant was stated to be the tenant of a

Corporation house, and as he did not pay his account for electricity consumed his supply was cut off. When the premises were afterwards visited it was found he had consumed 56 kWh since the date of the stoppage of supply. Defendant said he was out of work, and was sorry he committed the offence.

N.K. (Bradford), Ltd.

MR. JUSTICE MAUGHAM, in the Companies' Winding-up Court, on Monday last, made an order for the compulsory liquidation of N.K. (Bradford), Ltd., on the petition of the Armorduct Cable Co., Ltd., creditors of the company for £140, who were supported by the Vulcan Electrical & Mechanical Co., Ltd., and other creditors who had owing to them about £600.

Counsel for the petitioners said the respondent company was of rather a shadowy nature, only £2 of its capital being paid up in cash. The petition was not opposed.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Clifton Hampden Scheme.

On June 26th, Captain R. HENDERSON asked the Minister of Transport if he would state the cost of transmitting electricity from Didcot to Clifton Hampden, crossing the Thames by overhead and underground lines, respectively.

Colonel ASHLEY said he understood that at the inquiry held into the matter the applicants stated that they estimated that the cost of crossing the Thames by underground lines would be about £550 more than by overhead lines.

Spark Transmitters.

On June 28th, Mr. HORE-BELISHA asked the Postmaster-General whether the recommendations passed at the conference of radio experts at Washington last year on the matter of broadcasting, including the recommendation to prohibit the use of spark transmitters, had been considered by his department; and, if so, what action it was proposed to take.

Viscount WOLMER, who replied, said that the International Radiotelegraph Regulations drawn up at the Washington Conference last year provided for a gradual reduction in the use of the spark system. Under those regulations no *new* land station might be established on the spark system, and the use of spark transmitters by land stations was to be discontinued entirely by the end of 1934. The regulations permitted the use of spark transmitters on ships, although after the end of 1929 no *new* spark transmitter might be installed of higher power than 300 W, and after the end of 1939 no spark transmitter of higher power than 300 W might be used on a ship. The new regulations would be applied in this country, and a start had already been made in the work of converting British coast stations from the spark system to a different system.

The Railway Road Transport Bills.

The preamble of the Road Transport Bills which are being promoted by the four railway groups and the Metropolitan Railway Co. was found proved by a Select Committee of both Houses of Parliament on June 28th, except in the case of the Metropolitan Railway. Certain measures of protection for existing tramway and omnibus undertakings are to be included in the Bills.

The Marking of Imported Lamps and Cables.

In the course of a reply to a question by Sir N. GRATTAN DOYLE, Mr. H. G. WILLIAMS points out that the draft Order-in-Council providing for the marking of imported incandescent electric lamps and wires and cables is still before the House of Commons.

Bradford Trolley Vehicle Bill.

The Bill promoted by the Bradford Corporation sanctioning the extension of its railless trolley system has been passed for third reading by the Unopposed Bills Committee of the House of Commons.

Correspondence.

***Correspondents should forward their communications as early as possible.** No letter can be published unless we have the writer's name and address in our possession.*

Alternating Current in Three-core Mains.

I must thank "A.J.W." for going to such trouble to point out the slip I made in showing my vector diagrams rotating in a clockwise, instead of an anti-clockwise direction. I think, however, it was very obvious that it was my intention to lag the *following*, and not the *leading*, phase. My fig. 2 showed that quite plainly.

Also "A.J.W." perverts my argument, by showing, in his fig. 2, a current flowing in the lagging phase, of double the magnitude of that flowing in the leading phase. If he will look at my letter again, he will probably see that I definitely state that the currents in the two phases should be balanced.

Reading into his fig. 2, I should imagine that he is under the impression that I meant the true power to be balanced. If so, I would point out that my vectors had full arrow-heads, representing currents, and that it is the current with which a mains man is concerned, and this is what he attempts to balance. Feeder switches are fitted with ammeters, not watt-meters, and a trip is set to operate at a certain current, irrespective of power factor. The mains man must balance the currents carried per core of cable, not the true power transmitted per core.

Perhaps "A.J.W." will forgive me if I draw his attention to two mistakes he has made in his letter. Firstly, he described the phase rotation as RWB=WRB=BRW. Obviously WRB is the opposite rotation to RWB and BRW.

Secondly, he states that the resultant in his fig. 2 is equal in magnitude and direction to OB. I think that he will, on maturer consideration, see that the resultant is equal in magnitude, but *opposite* in direction to OB. "A.J.W." states in his concluding paragraph that: "Considerable wattless current would be carried in the lagging phase, thus restricting its useful load-carrying capacity." I would point out that this wattless current has to be carried in any case, unless the supply undertaking is going to refuse to connect inductive load.

In conclusion, I think I had better make it quite clear that I do not mean to load up the lagging phase with choke-coils, &c., in order to produce a low power-factor, but merely to arrange, or re-arrange the *existing* load, so that the lagging phase is still further lagged, and the currents flowing in each phase are equal. This is quite an easy matter if service load books are kept and the balancing of a distributor is treated with the care it deserves and should receive.

H. M. Price.

Birmingham, *June 30th*, 1928.

If all the inductive load were connected in the one phase and the non-inductive load in the other phase, I rather fancy the station superintendent would have something to say, but if it were practicable to arrange the feeders so that each phase in turn took the inductive and non-inductive load, that is if the summation of the load on all the feeders so connected up gave an equal load of similar power factor on each phase, then the scheme would appear to meet the difficulties mentioned.

H. E. Angold.

London, *June 20th*, 1928.

Super-pressure Cables.

I have noted Dr. Allen's reply to my letter in your issue of June 22nd, and regret that he found it necessary to suggest that my proposals were out of the realm of practical politics.

Does he suggest that *anything* of a higher voltage than 66,000 volts is "out of practical politics"?

And, if so, is he aware that one or two of the leading German firms from time to time advertise their readiness to carry out transmission with 110,000-volt underground cables; and that one, at least, is carrying out an important commercial transmission at 100,000 volts; or that the 132,000-volt "non-oil-fed" cables at Newark, New Jersey, have now been under test for about a year continuously at this pressure, and transmitting, at times, 80,000 kW?

One of these days it will come home to some of our consulting engineers that they are paying £400,000 on transmissions in certain cities where they could (I say "could"; but I might say "*can*") do the job for £100,000; and *then* pressures above 66,000 volts will come into the realm of "practical politics."

But it may be that this will be through the instrumentality of one of the firms that now advertise their ability to carry out 110,000-volt installations; and then there might be regrets that British firms were not allowed to do the job.

However, it is satisfactory to know that at least two British firms are ready (though apparently afraid to advertise it) to make these cables; and there are probably others—perhaps even Dr. Allen's firm?

A. M. Taylor,
Major, S.O.2.

Birmingham, *June 30th*, 1928.

A Small Circuit-breaker.

In your current issue we notice an illustration and a description of a small circuit-breaker offered by a well-known electrical concern, and you conclude the description by stating that you have received particulars of an almost identical unit supplied by another well-known company. May we ask you to state, in addition, that we have been supplying apparently identically similar circuit breakers for many years, but that, in addition to the range mentioned, we have supplied similar circuit-breakers, both double-pole and triple-pole, with delayed action

suitable for use as small motor starters. We expect very shortly to be able to supply these circuit-breakers up to 25 A capacity.

Haslam & Stretton, Ltd.
(THEODORE STRETTON, *Managing Director.*)

Cardiff, *June 30th*, 1928.

Directional Wireless and Marine Navigation.

While my article under the above title may have been rendered rather incomplete by the omission referred to in Mr. Andrew Gray's letter in your issue of June 22nd, I must say that in fundamental principles I have never recognised any difference between the rotation of a loop aerial and the use of fixed loops with a goniometer within which a search coil is rotated. The identity of these systems has been discussed by me on several occasions, and has been demonstrated both theoretically and experimentally,* but I admit that the addition of the words " or its equivalent " after " rotating closed-loop aerial," in the first paragraph of my article, would have made my meaning clearer. The behaviour of all systems of closed-loop direction-finding is essentially the same, and the mention of the Marconi Bellini-Tosi system would in no way have altered any one of the points made in my article. In the same manner the Bellini-Tosi system can be inverted into a rotating beacon transmitter without in any way altering the fundamental characteristics of its operation.

With all due respect to Mr. Gray and to Captain Sir Arthur Clarke, whose paper I had previously read with great interest, I fail to see how the mariner's point of view can be discussed until the mariner himself has had some practical experience of the rotating beacon. With the exception of the few ships' officers with whom I have come into contact in the course of my investigation during the last two years, I believe I am correct in stating that no member of the British Mercantile Marine has yet taken a single bearing from a rotating beacon. As Sir Arthur Clarke has pointed out, the question of costs must be considered as well as technical merits, but, as I stated in my article, until the first practical beacon station is built, it would appear to be rather premature to discuss the economics of the scheme at this date.

As I have no particular interests in any system of directional wireless I feel justified in repeating the plea given at the end of my article, that the rotating beacon shall be given a fair trial in its application to marine navigation before it is prematurely condemned.

R. L. Smith Rose.

Teddington, *June 26th*, 1928.

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* See, for example, Radio Research Board Special Report No. 1, 1923.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

30,313. "Sound-recording or reproducing apparatus, especially applicable to combined phonographic and kinematographic apparatus." Western Electric Co., Inc. May 26th, 1926. (271,810.)

30,710. "Apparatus for producing a varying light or illumination in television apparatus, photophones, and the like." J. L. Baird. December 3rd, 1926. (291,634.)

31,594. "Electrical switches." R. A. Millikan and R. W. Sorensen. December 13th, 1926. (291,815.)

31,600. "Means for converting alternating current into steady continuous current." Dubilier Condenser Co. (1925), Ltd. March 17th, 1926. (267,886.)

1927.

694. "Arrangement for automatically interrupting the network circuit of polyphase motors." R. Scholze and G. Keller (trading as P. Strobach (firm of)). January 10th, 1927. (291,819.)

3,587. "Electric switching apparatus for power-driven vehicles." Scintilla Akt.-Ges. February 15th, 1926. (265,967.)

5,009 "Leaden plates for accumulators." E. F. Draisma. February 22nd, 1927. (291,833.)

6,025. "Introduction of electrodes into vacuum vessels." W. Dallenbach. March 4th, 1926. (267,136.)

6,031. "Electron emission devices." A. P. Castellain. March 3rd, 1927. (291,846.)

6,081. "Electric remote control and supervisory systems." W. E. Beatty (Electrical Research Products, Inc.). March 4th, 1927. (Patent of addition not granted.) (291,847.)

6,326. "Electric transmitters suitable for use in automatic telegraphy." Creed & Co., Ltd., and R. D. Salmon. March 7th, 1927. (291,854.)

6,443. "Telemotor-operated liquid discharge and admission valves." Vickers, Ltd., and J. Wardle. March 8th, 1927. (291,861.)

6,467. "Sound amplifiers." H. Fischer. March 8th, 1927. (291,862.)

6,479. "Braking means for locomotive trucks." L. Miller, R. C. Mortimer, and Metropolitan-Vickers Electrical Co., Ltd. March 8th, 1927. (291,863.)

6,505. "Electro-therapeutic apparatus." J. H. T. Roberts. March 8th, 1927. (291,865.)

6,604. "Apparatus for the control of electric circuits." H. V. James and A. H. Stevens. March 9th, 1927 (291,869.)

6,608. "Electrical starting switches." A. K. Croad (Naamlooze Vennootschap Fabriek van Elektrische Apparaten vootheen F. Hazemeyer & Co.). March 9th, 1927. (291,870.)

6,620. "Single-core electric cables." Standard Telephones & Cables, Ltd., T. N. Riley, and T. R. Scott. March 9th, 1927. (291,871.)

6,662. "Electric selective signalling and control systems." General Electric Co., Ltd., and H. C. Hannam-Clark. March 10th, 1927. (291,874.)

6,889. "Apparatus to signal when an accumulator is fully charged at a distance therefrom." F. H. Royce. March 11th, 1927. (291,885.)

6,980. "Four electrode valves." J. Bethenod. March 12th, 1926. (267,555.)

6,985. "Electric clocks." Poole Manufacturing Co., Inc. January 6th, 1927. (283,167.)

6,992. "Telephone systems." Associated Telephone & Telegraph Co. July 6th, 1926. (274,033.)

7,243. "Thermionic amplifiers." H. J. Stenning and Edison Swan Electric Co., Ltd. March 15th, 1927 (291,894.)

7,350. "Electrical heating and cooking apparatus." G. Sanders. March 16th, 1927. (291,896.)

7,698. "Electric vacuum tubes or lamps." E. Ellis. March 21st, 1927. (291,907.)

8,151. "Electric switches." British Thomson-Houston Co., Ltd., and H. C. Heath. March 24th, 1927. (291,911.)

10,313. "Electric arc lamps for therapeutic and other purposes." C. E. Baron and R. P. Myers. April 14th, 1927. (Cognate application 359/28.) (291,927.)

11,335. "Electric switchboards and the like." British Thomson-Houston Co., Ltd., and H. C. Heath. April 28th, 1927. (291,932.)

14,309. "Means for attaching hollow conductors to supporting and tensioning members." A. L. Mond (Metallbank und Metallurgische Ges.). May 27th, 1927. (291,948.)

15,363. "Locking devices for electric incandescent lamps." R. O. Hughes and Francis Lamp Locks, Ltd. June 9th, 1927. (291,954.)

16,701. "Clamps for electric conductors." J. W. Hofmann. June 23rd, 1927. (291,968.)

20,016. "Trolley heads as used on electric tramway and railway vehicles." A. C. Baker and H. M. Dungeon. July 28th, 1927. (291,984.)

22,096. "Cooling arrangements for dynamo-electrical machines." O. T. Blathy. February 23rd, 1927. (288,845.)

22,401. "Electrical terminal connections." A. R. P. Johnson. August 25th, 1927. (291,992.)

23,465. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. September 9th, 1926. (277,340.)

25,017. "Electric regulating devices." British Thomson-Houston Co., Ltd., and R. D. Parry. February 11th, 1927. (Divided application on 278,060.) (Addition to 278,060.) (292,001.)

25,326. "Illuminated signs." A. S. Cubitt. September 26th, 1927. (292,002.)

27,071. "Electrically-driven spindles for spinning yarn." I. G. Farbenindustrie Akt.-Ges. November 12th, 1926. (280,512.)

27,228. "Diaphragms for reproducing sound." Electrical Research Products, Inc. May 11th, 1927. (290,335.)

28,263. "Method of attachment of supply cables to the brushes of electric machines and the like." Soc. Anon. Le Carbone. January 3rd, 1927. (283,102.)

30,328. "Current collectors for electric motor vehicles." I. Tobisch (trading as Maschinenfabrik C. Goldebaud). November 25th, 1926. (281,268.)

30,555. "Rectifiers for electric currents." Siemens-Schuckertwerke Akt.-Ges. and G. Scharowsky. November 14th, 1927. (292,014.)

30,556. "Apparatus for the electrolytic production of metallic sheets and similar articles." J. C. F. A. Schutte. November 14th, 1927. (292,015.)

30,714. "Electrical amplification systems." Westinghouse Electric and Manufacturing Co. November 30th, 1926. (281,633.)

31,551. "Automatic switches for use in telephone or like systems." J. E. Pollak (Associated Telephone & Telegraph Co.). March 12th, 1927. (Divided application on 274,033.) (292,020.)

31,552. "Automatic switches for use in telephone systems." Associated Telephone & Telegraph Co. July 6th, 1926. (Divided application on 274,033.) (281,304.)

32,306. "Apparatus for measuring especially high electric voltages." H. Dember. November 30th, 1926. (281,677.)

32,379. "Filaments for electric incandescent lamps." Soc. Française des Lampes à Incandescence Luxor. December 1st. 1926. (281,685.)

32,434. "Electrical plant for the transmission of power." C. G. N. Poolman. December 1st. 1927. (292,025.)

32,450. "Method of protecting transformers, switches, motors, generators, and similar electrical apparatus." M. Buchholz. December 15th, 1926. (282,370.)

32,830. Detectors for electric waves." Siemens-Schuckertwerke Akt-Ges. December 6th, 1926. (281,720.)

34,536. "Devices for instantaneously striking the arc in arc lamps." Anciens Etablissements Barbier, Benard & Turenne Soc. Anon. December 27th, 1926. (282,471.)

35,126. "Means for effecting a step-by-step motion of electric contacts." Allmanna Svenska Elektriska Aktiebolaget. September 1st, 1927. (292,037.)

1928.

1,849. "Manufacture of electric incandescent lamps or the like." General Electric Co., Ltd. January 26th, 1927. (284,263.)

2,061. "Radio transmission systems." C. Lorenz Akt.-Ges. February 3rd, 1927. (284,665.)

9,540. "Control levers of electric winding engines." Siemens-Schuckertwerke Akt.-Ges. May 6th, 1927. (289,869.)

9,871. "Method of and apparatus for reducing sheath current." Okonite Co. April 8th, 1927. (288,293.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 27th :—

Jacelite. Nos. 489,385, 489,386, 489,387, 489,388, 489,389, 489,390, 489,392, 489,393, 489,394, and 489,395. All goods in Classes 2, 6, 8, 11, 12, 13, 17, 18, 40 and 49 respectively. No. 480,370. Class 50. Condensation products of formaldehyde or casein, thermo-plastic and thermo-setting products, &c.—J. A. Crabtree & Co., Ltd., Walsall.

Crabtree No. 484,047. Class 8. Fitted electrical switch- and fuse-boards. No. 478,568. Class 13. Electrical metal goods, including switches, fusible cut-outs, &c. No. 484,048. Class 13. Metal goods for use in electric lighting, heating, signalling and power installations. No. 484,049. Class 15. Wall plates, and cover plates for switches, bell pushes, &c. No. 484,050. Class 50. Articles made from condensation products of formaldehyde or casein, or from thermo-plastic or thermo-setting products, wood, mica, or other non-conducting material.—J. A. Crabtree & Co., Ltd. Walsall.

Crab Tree. No. 484,056. Class 13. Metal goods for use in electric lighting, heating, signalling and power installations.—J. A. Crabtree & Co., Ltd., Walsall.

Taurus (lettering and design). No. 482,436. Class 5. Enamelled wire.—Die Isolier Draht Gesellschaft, Thurgovie, Switzerland. (British representative: Eric Potter, 27, Chancery Lane, W.C.2.)

Newtons, Taunton (lettering and design). No. 488,771. Class 6. Electrical machinery and parts thereof.—No. 488,772. Class 8. Lighting installations.—Rotax (Motor Accessories) Ltd., Willesden Junction, N.W.10.

Storan. No. 488,738. Class 8. Radio-telephonic instruments.—Storey Bros. and Co., 57, Church Street, Runcorn.

Steval (lettering and design). No. 490,939. All goods in Class 8.—Steval, Ltd., 133, Oxford Street, W.1.

Vibroholder. No. 491,702. Class 8. Apparatus for use in wireless telephony and telegraphy.—Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.

Skelto. No. 491,410. Class 15. Glass signs.—Berry's Electric, Ltd., 85-86, Newman Street, W.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALTRINCHAM.—Housing scheme (24), Oldfield Brow (deposit £2 2s.); H. E. Brown, surveyor, Town Hall.

BEXHILL.—Estate development, Haddocks Hill; J. H. Lye, for F. H. Bishop.

BOLTON.—Thirty-six houses, Pilling Street; Wilfred Andrew. Housing scheme, land on Bridgwater Estate; borough engineer. Schools at Smithills, Heaton, Crompton Fold, and Tonge Moor; Education Committee.

BOURNEMOUTH.—Additions, Boscombe Hippodrome; General Theatre Corporation, Ltd.

BRAINTREE.—Extensions, High School for Essex E.C.; J. Stuart, county architect, Chelmsford (returnable deposit of £1 1s.).

BROMLEY (KENT).—Reconstruction of refuse destructor plant (£8,900), for the T.C.; borough engineer.

CARLISLE.—Wesleyan church and schools (£15,000); Brocklehurst & Co., architects, Manchester; John Laing & Son, builders.

CHELMSFORD.—Further 100 houses, Boarded Barns Estate; borough engineer.

CHESTER.—Housing scheme (116), Eaton Road (deposit £2 2s.); C. Greenwood, city engineer, Municipal Offices.

CHESTERFIELD.—Block of shops, café, and ballroom, Knifesmithgate, for Victoria Enterprises, Ltd.

COSELEY (STAFFS.).—Senior school for the E.C.; J. C. Poole,, secretary.

CREWE.—School (£31,985), for the Borough E.C.; borough architect.

CROYDON.—120 houses, Mitcham Estate; borough engineer. 50 houses, Mitcham Road; H. Parker & Co., Ltd., Victoria Street, S.W. School, Lodge Road; A. Sunderland, architect for Education Committee.

DERBY.—Silk factory, for British Breda Silk Co.

EDINBURGH.—Twelve shops and 24 houses for Corporation; city architect. Additions and alterations to Surgical Outpatients' Department at Royal Infirmary; medical superintendent.

EVESHAM.—Additional 52 houses for the T.C.; borough surveyor.

FILEY.—Housing scheme (24); H. C. Cowen, surveyor to U.D.C.

FRIMLEY.—Secondary school; Surrey county architect.

GLOSSOP.—Alterations and additions, Sheffield Road; Mulcot Belting Co., Ltd. Improvements, St. Mary's and the Duke of Norfolk's Schools; Catholic trustees.

GUILDFORD.—Development, Stoke Rectory Estate; Folker and Horton.

HALESOWEN.—Housing scheme (62), Hurst Green, for the U.D.C.; T. S. Beach, architect, Old Public Offices, Great Cornbow (returnable deposit of £2 2s.).

HOYLAND COMMON (YORKS.).—Catholic Church (£8,000); Rev. Father James Grogan.

IRISH FREE STATE (CORK).—Extensions to University College (£55,570); H. H. Hill, architect, 22, George's Street. Housing scheme (152) for the Corporation; Housing Corporation of Gt. Britain, Ltd.

KENDAL.—Installation of electricity plant, Milnthorpe Institution, for the B.G.; clerk.

KIDDERMINSTER.—Power house, Exchange Street, for Brintons, Ltd., carpet manufacturers. Weaving shed and extensions, for T. & A. Naylor, Ltd., Green Street.

KILMARNOCK.—Housing scheme (24), with electric lighting, for the T.C.; Robert Armour, 38, Bank Street (July 9th).

KIRKBURTON.—Operating theatre at Storthes Hall Mental Hospital; W. E. H. Burton, A.M.I.C.E., architect and engineer, Mental Hospital Board's Offices, Wakefield; tenders by July 11th to H. Topham, clerk to board, Wakefield.

LEICESTER.—Houses on Braunstone Estate; Browning Bros. (24), Harris Bros. (92), Bambury & Sowden (246).

LINCOLN.—Re-erection of motor body works, Newark Road, for the Bracebridge Motor Works Co., Ltd. (several thousand pounds).

LONDON (HACKNEY, E.).—100 tenements, Southwold Road; Rowley Bros., Ltd., Tower Works, Dunloe Avenue, N.15. Eighty maisonettes, Dudlington Road (£59,000); borough engineer.

(POPLAR, E.).—Extensions, School of Engineering and Navigation, High Street; L.C.C. Education Committee.

(SPITALFIELDS, E.).—Market premises (£271,000); Sir Robert McAlpine & Sons.

(HENDON, N.W.).—Development of 74 acres off Edgware Road; D. Alwyn.

(LAMBETH, S.E.).—Tenements, China Walk (£29,500), for L.C.C.; A. T. Rowley, Tottenham.

(SOUTHFIELDS, S.W.).—Factory and offices, The Baulk; Walter Lawrence & Sons, Ltd. Factory, Merton Road; Camwal, Ltd. Rebuilding Bell Lane Granary; Edwin Evans & Son.

(HAMMERSMITH, S.W.).—Elementary school, Wormholt Estate (£14,000); J. E. Billings & Co., Ltd.

(WESTMINSTER, S.W.).—Blocks of tenements, Ebury Bridge, for City Council; H. V. Ashley & Winton Newman, architects. Reconstruction, Grosvenor Wharf (£85,000); L. J. Speight, Ltd., Kingsway.

(WIMBLEDON, S.W.).—Drying and packing sheds, Paxton's Works, East Road; Cook & Co.

(ST. MARYLEBONE, W.).—Buildings, Baker Street Station; C. W. Clark.

(STRAND, W.C.).—Cinema, Villiers Street; G. Thrale Jell.

MALDON.—Additions to Champion Lodge, Heybridge, for Sir C. Champion de Crespigny.

MORECAMBE.—Development, Anstable Holme Estate; Wm. Gardner & Co., Ltd. Extensions, St. Mary's Catholic Church, Lord Street; Rev. Father Kiernan. 50 houses, Football Field; borough engineer.

MORETON (BIRKENHEAD).—Assembly and dance halls; George Prince, architect.

NEWBURY.—Engine room extensions, Power Station; Urban Electric Supply Co. Workshop, West Mills, Hoskings and Pond. Alterations and additions, New Bury Steam Laundry, York Road.

RIPON.—Conversion of High Skellgate premises into library; city engineer.

ROMILEY (STOCKPORT).—Cinema and shops, for the Romiley Cinema Theatre, Ltd. (£13,860); Charles Clegg & Son, architects, Adelphi Chambers, Brown Street, Manchester; Peace & Norquoy, Ltd., builders, Manchester.

SALFORD.—Post office, for H.M. Office of Works, King Charles Street, London, S.W.

SANDY (BEDS.).—Electric light installation, Conservative Club; F. H. L. Blaine, secretary (returnable deposit of 5s.).

SHIPLEY.—Printing works, Leeds Road; E. Illingworth and Co. Extensions, Midland Dye Works; Shaw & Co., Ltd. Extensions, Central School (£4,000); Education Committee. 24 houses, Wrose Brow Estate; U.D.C. surveyor.

SHOREHAM (SUSSEX).—Town Hall extensions (£7,000), for the U.D.C.; J. L. Denman, architect.

SLOUGH.—Houses (106), Leeds Road and Carmarthen Road, for Henry Heath.

STAMFORD (LINCS.).—Extensions to Infirmary, for the governors (£14,000); Traylen & Lenton, architects, Broad Street.

STOCKTON-ON-TEES.—Alterations and additions to the Isolation Hospital; J. H. Wakefield, borough engineer, Victoria Buildings.

STOKE-ON-TRENT.—Further 50 houses for Michelin Tyre Co.; city engineer.

SURREY.—Small holdings (£40,000); County Agricultural Committee.

TENTERDEN (KENT).—Church, Ashford Road; Weeks & Sons, builders.

UXBRIDGE.—Stores and cottage, Dolphin Wharf; Cement Marketing Co., Ltd.

WALTHAM ABBEY.—Housing scheme (50), Crooked Mile Estate, for the U.D.C.; surveyor.

WESTON-SUPER-MARE.—Cabinet-making works, off Locking Road, for Autton & Moore.

WORCESTER.—Housing scheme (50), Foxwell Street; W. Ransom, city engineer, Guildhall.